

Name: Alter, Orly | <https://alterlab.org/> | **Citizenship:** Israel and U.S.
Position Title: USTAR Associate Professor of Bioengineering and Human Genetics at the Scientific Computing and Imaging Institute and the Huntsman Cancer Institute at the University of Utah
LinkedIn: <https://linkedin.com/in/orly-alter>

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

2016– Chief Technology Officer (CTO) and Co-Founder, Eigengene, Inc.
2016– Investigator, and Member of the Cancer Control and Population Sciences Program, Huntsman Cancer Institute (HCI), University of Utah
2010– Utah Science, Technology, and Research (USTAR) Associate Professor, Scientific Computing and Imaging (SCI) Institute and Departments of Bioengineering and Human Genetics, 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 of 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

2009–2015 Faculty Early Career Development (CAREER) Award, Division of Mathematical Sciences (DMS), NSF
2005 Linear Algebra and its Applications (LAA) Lecture of the International Linear Algebra Society (ILAS);
https://alterlab.org/in_the_news/Alter_ILAS_Bulletin_2005_Feature.pdf
2000–2005 Individual Mentored Research Scientist Development Award in Genomic Research and Analysis, National Human Genome Research Institute (NHGRI), NIH
1999–2003 DOE/Sloan Foundation Postdoctoral Fellowship in Computational Molecular Biology
1998 Outstanding Doctoral Thesis Research in Atomic, Molecular, or Optical Physics (DAMOP) Award Finalist, American Physical Society (APS);
https://alterlab.org/in_the_news/Ripin_APS_News_1998_Feature.pdf

Google Scholar: <https://scholar.google.com/citations?user=RKh11ecAAAAJ&hl=en>

Publications

Corresponding author(s) underlined.

Books in Preparation

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

Books

2. O. Alter and Y. Yamamoto, *Quantum Measurement of a Single System*. New York, NY: Wiley-Interscience (May 2001), 136 pp.;
<https://doi.org/10.1002/9783527617128>
https://alterlab.org/publications/Alter_Yamamoto_Wiley-Interscience_2001.pdf

Journal Papers in Preparation

3. S. P. Ponnappalli and **O. Alter**, “Mathematical Discovery and Computational Validation of Two Orthogonal Whole-Genome Genotypes Predictors of Two Independent Pediatric Neuroblastoma Nerve Cancer Survival Phenotypes” (in preparation).
4. 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” (in preparation).

Journal Papers

5. 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>
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;
<https://aip-info.org/1XPS-7KD96-527719389D75CF2AOLGQ4XE7DE4193976FA499/cr.aspx>
6. 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>
7. 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>
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;
<https://aip-info.org/1XPS-6A0AU-C5ITTQWO7B/cr.aspx>
8. 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>
9. 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>
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://thepathologist.com/issues/0615/big-data-hidden-knowledge/>
https://alterlab.org/in_the_news/Pavlou_Pathologist_2015_Feature.pdf

Journal Papers (continued)

10. 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>
Highlight: https://alterlab.org/research/highlights/poner0078913_Highlight.pdf
11. 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>
Highlight: https://alterlab.org/research/highlights/poner0030098_Highlight.pdf
12. 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>
Mention: Among the top 10% most cited *Public Library of Science (PLoS) One* articles as of 2017.
Highlight: https://alterlab.org/research/highlights/poner0028072_Highlight.pdf
13. 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>
Highlight: https://alterlab.org/research/highlights/poner0018768_Highlight.pdf
14. 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>
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
15. 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>
16. **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>
17. **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 (December 2005);
<https://doi.org/10.1073/pnas.0509033102>
18. **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>
19. **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>
Feature: J. Wixon and J. Ashurst, "Genome Informatics," *Computational 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

Journal Papers (continued)

20. S. P. Bochen, 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>
21. 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
22. **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>
23. **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
24. **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
25. **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
26. **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
27. **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
28. **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

29. **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>

Book Chapters

30. **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

Book Chapters (continued)

31. **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>
32. **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
33. **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*. Weinheim, Germany: Wiley-VCH, pp. 539–544 (October 1996);
https://alterlab.org/publications/Alter_Yamamoto_Quantum_Interferometry_1996.pdf
34. **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
35. **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 (April 1995);
<https://doi.org/10.1111/j.1749-6632.1995.tb38960.x>
https://alterlab.org/publications/Alter_Yamamoto_NYAS_1994.pdf

Technical Reports

36. K. A. Aiello, S. P. Ponnappalli and **O. Alter**, "Mathematically Universal and Biologically Consistent Astrocytoma Genotype Encodes for Transformation and Predicts Survival Phenotype," *2018 American Association for Cancer Research (AACR) Annual Meeting* (Chicago, IL, April 14–18, 2018). Philadelphia, PA: AACR (July 2018);
<https://doi.org/10.1158/1538-7445.AM2018-4262>
37. K. A. Aiello, C. A. Maughan, T. E. Schomay, 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 American Association for Cancer Research (AACR) Annual Meeting* (Chicago, IL, April 14–18, 2018). Philadelphia, PA: AACR (July 2018);
<https://doi.org/10.1158/1538-7445.AM2018-4267>
38. **O. Alter**, "DNA Copy-Number Alterations in Primary Ovarian Serous Cystadenocarcinoma Encoding for Cell Transformation and Predicting Survival and Response to Platinum Therapy Throughout the Course of the Disease," *American Association for Cancer Research (AACR) Special Conference on Advances in Ovarian Cancer Research: Exploiting Vulnerabilities* (Orlando, FL, October 17–20, 2015). Philadelphia, PA: AACR (January 2016);
<https://doi.org/10.1158/1557-3265.OVCA15-A60>
39. S. P. Ponnappalli, G. H. Golub and **O. Alter**, "A Novel Higher-Order Generalized Singular Value Decomposition for Comparative Analysis of Multiple Genome-Scale Datasets," *Workshop on Algorithms for Modern Massive Datasets (MMDS)*. Stanford, CA: Stanford University and Yahoo! Research (June 21–24, 2006);
https://alterlab.org/publications/Ponnappalli_et_al_MMDS_2006_Abstract.pdf
40. **O. Alter**, G. H. Golub, P. O. Brown and D. Botstein, "Novel Genome-Scale Correlation between DNA Replication and RNA Transcription During the Cell Cycle in Yeast is Predicted by Data-Driven Models." In: M. P. Deutscher, S. Black, P. E. Boehmer, G. D'Urso, T. Fletcher, F. Huijing, A. Marshall, B. Pulverer, B. Renault, J. D. Rosenblatt, J. M. Slingerland and W. J. Whelan, editors, *Miami Nature Biotechnology Winter Symposium: Cell Cycle, Chromosomes and Cancer*. Miami Beach, FL: University of Miami School of Medicine, vol. 15 (January 31 – February 4, 2004);
https://alterlab.org/publications/Alter_et_al_MNBWS_2004.pdf

Patents Issued

41. **O. Alter**, "Genetic Alterations in Glioblastoma," *European Patent* EP 2773777 A4 (Issued May 2020); <https://patents.google.com/patent/EP2773777A4>
42. **O. Alter**, "Genetic Alterations in Glioma," *United States Patent* US 10202643 B2 (Issued February 2019); <https://patents.google.com/patent/US10202643B2>

Patents Filed

43. **O. Alter**, "Advanced Tensor Decompositions for Computational Assessment and Prediction from Data," *United States Nationalized Patent Cooperation Treaty (PCT)* US 20180301223 A1 (Filed April 2014); <https://patents.google.com/patent/US20180301223A1>
44. **O. Alter**, "Genetic Alterations in Ovarian Cancer," *United States Nationalized PCT* US 20180122507 A1 (Filed April 2014); <https://patents.google.com/patent/US20180122507A1>
45. **O. Alter**, "Genomic Tensor Analysis for Medical Assessment and Prediction," *United States Nationalized PCT* US 20140249762 A1 (Filed March 2014); <https://patents.google.com/patent/US20140249762A1>
46. **O. Alter**, "Genomic Tensor Analysis for Medical Assessment and Prediction," *European Nationalized PCT* EP 2754077 A4 (Filed September 2012); <https://patents.google.com/patent/EP2754077A4>

Copyrighted Software in Preparation

1. © S. P. Ponnappalli and **O. Alter**, "Mathematical Discovery and Computational Validation of Two Orthogonal Whole-Genome Genotypes Predictors of Two Independent Pediatric Neuroblastoma Nerve Cancer Survival Phenotypes" (in preparation).

Copyrighted Software

2. © S. P. Ponnappalli and **O. Alter** 2020, "Retrospective Clinical Trial Experimentally Validates Glioblastoma Genome-Wide Pattern of DNA Copy-Number Alterations Predictor of Survival;" https://alterlab.org/GBM_retrospective_clinical_trial/
3. © M. W. Bradley, S. P. Ponnappalli, H. A. Hanson and **O. Alter** 2019, "GSVD- and Tensor GSVD- Uncovered Patterns of DNA Copy-Number Alterations Predict Adenocarcinomas Survival in General and in Response to Platinum;" https://alterlab.org/adenocarcinomas_genotype-phenotype/
4. © K. A. Aiello, S. P. Ponnappalli and **O. Alter** 2018, "Mathematically Universal and Biologically Consistent Astrocytoma Genotype Encodes for Transformation and Predicts Survival Phenotype;" https://alterlab.org/astrocytoma_genotype-phenotype/
5. © K. A. Aiello and **O. Alter** 2016, "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;" https://alterlab.org/astrocytoma_prognosis/
6. © P. Sankaranarayanan, T. E. Schomay, K. A. Aiello and **O. Alter** 2015, "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;" https://alterlab.org/OV_prognosis/
7. © N. M. Bertagnolli, J. A. Drake and **O. Alter** 2013, "SVD Identifies Transcript Length Distribution Functions from DNA Microarray Data and Reveals Evolutionary Forces Globally Affecting GBM Metabolism;" https://alterlab.org/GBM_metabolism/
8. © B. O. Alpert and **O. Alter** 2012, "GSVD Comparison of Patient-Matched Normal and Tumor aCGH Profiles Reveals Global Copy-Number Alterations Predicting Glioblastoma Multiforme Survival;" https://alterlab.org/GBM_prognosis/
9. © S. P. Ponnappalli and **O. Alter** 2011, "A Higher-Order Generalized Singular Value Decomposition for Comparison of Global mRNA Expression from Multiple Organisms;" https://alterlab.org/HO_GSVD/
10. © A. M. Gross and **O. Alter** 2011, "Tensor Decomposition Reveals Concurrent Evolutionary Convergences and Divergences and Correlations with Structural Motifs in Ribosomal RNA;" <https://alterlab.org/rRNA/>

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11. © **O. Alter** 2009, "Global Effects of DNA Replication and DNA Replication Origin Activity on Eukaryotic Gene Expression;"
https://alterlab.org/verification_of_prediction/
12. © **O. Alter** 2007, "A Tensor Higher-Order Singular Value Decomposition for Integrative Analysis of DNA Microarray Data from Different Studies;"
<https://alterlab.org/HOSVD/>
13. © **O. Alter** 2006, "Singular Value Decomposition of Genome-Scale mRNA Lengths Distribution Reveals Asymmetry in RNA Gel Electrophoresis Band Broadening;"
https://alterlab.org/harmonic_oscillator/
14. © **O. Alter** 2005, "Reconstructing the Pathways of a Cellular System from Genome-Scale Signals by Using Matrix and Tensor Computations;"
https://alterlab.org/network_decomposition/
15. © **O. Alter** 2004, "Integrative Analysis of Genome-Scale Data by Using Pseudoinverse Projection Predicts Novel Correlation between DNA Replication and RNA Transcription;"
<https://alterlab.org/pseudoinverse/>
16. © **O. Alter** 2003, "Generalized Singular Value Decomposition for Comparative Analysis of Genome-Scale Expression Datasets of Two Different Organisms;"
<https://alterlab.org/GSVD/>
17. © **O. Alter** 2001, "Processing and Modeling Genome-Wide Expression Data Using Singular Value Decomposition;"
<https://alterlab.org/SVD/>
18. © **O. Alter** 2000, "Singular Value Decomposition for Genome-Wide Expression Data Processing and Modeling;"
https://alterlab.org/singular_value_decomposition/

Research in the News

1. Mention: Among the most shared *Applied Physics Letters (APL) Bioengineering* research as of 2021;
<https://aip-info.org/1XPS-7KD96-527719389D75CF2AOLGQ4XE7DE4193976FA499/cr.aspx>
2. 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>
3. Mention: Among the top 10 most downloaded *Applied Physics Letters (APL) Bioengineering* articles as of 2019;
<https://aip-info.org/1XPS-6A0AU-C5ITTQWO7B/cr.aspx>
4. 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>
5. Mention: Among the top 10% most cited *Public Library of Science (PLOS) One* articles as of 2017.
6. Feature: F. Pavlou, "Big Data, Hidden Knowledge," *The Pathologist* (June 15, 2015);
<https://thepathologist.com/issues/0615/big-data-hidden-knowledge/>
https://alterlab.org/in_the_news/Pavlou_Pathologist_2015_Feature.pdf
7. 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
8. 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>
9. Recommendation: M. Méchali, *Faculty Opinions* recommendation 1728974 (February 2010);
<https://facultyopinions.com/prime/1728974#tab=abstract>
10. 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);
https://alterlab.org/in_the_news/Dwivedi_IBS_Bulletin_2010_Feature.pdf
11. 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>

Research in the News (continued)

12. Excerpt: O. Alter, "2005 Linear Algebra and its Applications (LAA) Lecture," *IMAGE: International Linear Algebra Society (ILAS) Bulletin* 35, pp. 2–15 (December 2005);
https://alterlab.org/in_the_news/Alter_ILAS_Bulletin_2005_Feature.pdf
13. 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
14. Feature: J. Wixon and J. Ashurst, "Genome Informatics," *Computational Functional Genomics* 4 (5), pp. 509–514 (October 2003);
https://alterlab.org/in_the_news/Wixon_Ashurst_Comp_Funct_Genom_2003_Feature.pdf
15. 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
16. Feature: B. H. Ripin, "1998 Outstanding Doctoral Thesis Research in Atomic, Molecular, or Optical Physics (DAMOP) Award Finalists," *American Physical Society (APS) News* 7 (8), p. 5 (August–September 1998);
https://alterlab.org/in_the_news/Ripin_APS_News_1998_Feature.pdf

YouTube Channel: <https://youtube.com/channel/UC3pGZnzlrGPCYFedjig-fQw>

Lectures by Orly Alter YouTube Playlist:

https://youtube.com/playlist?list=PLhI_42SVen3Sbu_8vjCkHDyMtoeLM2l1U

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;
YouTube: <https://youtu.be/s4ezu0OHKAs>
Slides: https://alterlab.org/presentations/Alter_AWS_Education_Research_2020_Slides.pdf

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

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

2. *2022 Society for Industrial and Applied Mathematics (SIAM) Conference on Mathematics of Data Science (MDS22)* (San Diego, CA, September 26–30, 2022).
3. *International High-Performance Computing (HPC) Summer School 2022 on HPC Challenges in Computational Sciences* (Athens, Greece, June 19–24, 2022).
4. *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"

5. *26th Annual Meeting of the Society for Neuro-Oncology (SNO)* (Boston, November 18–21, 2021);
<https://www.eventscribe.net/2021/SNO/fsPopUp.asp?Mode=presenterInfo&HPRID=1435415>
Slides: https://alterlab.org/presentations/Alter_SNO_2021_Slides.pdf
YouTube: <https://youtu.be/oMfYXLZfrmo>
6. *2021 SIAM Virtual Conference on Applied Algebraic Geometry* (August 16–20, 2021).
7. *International HPC Virtual Summer School 2021 on HPC Challenges in Computational Sciences* (July 18–30, 2021).
8. *Decade of the Physical Sciences in Oncology Network (PS-ON) at the National Cancer Institute (NCI) Virtual Symposium* (September 21–23, 2020);
Slides: https://alterlab.org/presentations/Alter_NCI_PS-ON_2020_Slides.pdf
YouTube: <https://youtu.be/5LKYwVby9Rc>
9. *2020 American Association for Cancer Research (AACR) Virtual Annual Meeting II* (June 22–24, 2020);
<https://www.abstractsonline.com/pp8/#!/9045/presentation/4647>
Slides: https://alterlab.org/presentations/Alter_AACR_2020_Slides.pdf
YouTube: <https://youtu.be/rXEbMnL8iGc>
10. *NCI Physical Sciences in Oncology Symposium* (Minneapolis, MN, September 18–20, 2019);
<https://twitter.com/NCIPhySci/status/1175068192781344768>

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

11. *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).
12. *International Congress on Industrial and Applied Mathematics (ICIAM) 2019* (Valencia, Spain, July 15–19, 2019).
13. *2018 Biomedical Engineering Society (BMES) Annual Meeting* (Atlanta, GA, October 27–20, 2018).
14. *NCI Joint Meeting of the Cancer Systems Biology Consortium (CSBC) and the PS-ON* (Bethesda, MD, September 25–28, 2018).
15. *European Association for Signal Processing (EURASIP) Summer School on Tensors in Medicine* (Leuven, Belgium, August 27–31, 2018).
16. *2018 Society for Industrial and Applied Mathematics (SIAM) Annual Meeting* (Portland, OR, July 9–13, 2018).
17. *14th International Conference on Latent Variable Analysis and Signal Separation (LVA ICA)* (Guildford, United Kingdom, July 2–6, 2018);
<https://cvssp.org/events/lva-ica-2018/keynotes/#only>
18. *9th Multidisciplinary Conference on Three-Way Methods in Chemistry and Psychology (TRICAP)* (Angel Fire, NM, June 10–15, 2018).
19. *3rd Nordic Institute for Theoretical Physics (NORDITA) Meeting on Quantitative Perspectives on Cancer* (Stockholm, Sweden, May 28 – June 1, 2018).
20. *2018 SIAM Conference on Applied Linear Algebra (SIAM-ALA18)* (Hong Kong, China, May 4–8, 2018);
<https://www.math.hkbu.edu.hk/siam-ala18/Invited.html>
21. *2017 SIAM Conference on Applied Algebraic Geometry* (Atlanta, GA, July 31 – August 4, 2017).
22. *International HPC Summer School 2017 on HPC Challenges in Computational Sciences* (Boulder, CO, June 25–30, 2017).
23. *1st Gordon Research Conference on the Physics of Cancer* (Galveston, TX, February 5–10, 2017).
24. *Australian Mathematical Sciences Institute (AMSI) BioInfoSummer 2016* (Adelaide, SA, Australia, November 28 – December 2, 2016).
25. *NCI Joint Meeting of the CSBC and the PS-ON* (Rockville, MD, August 29–31, 2016).
26. *20th International Linear Algebra Society (ILAS) Meeting* (Leuven, Belgium, July 11–15, 2016).
27. *2016 SIAM Annual Meeting* (Boston, MA, July 11–14, 2016).
28. *International HPC Summer School 2016 on HPC Challenges in Computational Sciences* (Ljubljana, Slovenia, June 26 – July 1, 2016).
29. *NCI Physical Sciences in Oncology Symposium* (Rockville, MD, February 2–3, 2016).
30. *2016 Tensor Decompositions and Applications (TDA) Workshop* (Leuven, Belgium, January 18–22, 2016).
31. *2015 Joint Statistical Meetings (JSM)* (Seattle, WA, August 8–13, 2015).
32. *International HPC Summer School 2015 on HPC Challenges in Computational Sciences* (Toronto, Canada, June 21–26, 2015).
33. *Joint Applied Mathematics, Modeling and Computational Science and Canadian Applied and Industrial Mathematics Society (AMMCS-CAIMS) Congress* (Waterloo, Canada, June 7–12, 2015).
34. *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”

35. *48th Annual Asilomar Conference on Signals, Systems, and Computers* (Pacific Grove, CA, November 2–5, 2014).
36. *5th Association for Computing Machinery (ACM) Conference on Bioinformatics, Computational Biology and Health Informatics (ACM-BCB)* (Newport Beach, CA, September 20–23, 2014);
<https://www.cse.buffalo.edu/ACM-BCB2014/panel.html>
37. *2014 American Association of Physicists in Medicine (AAPM) Annual Meeting Science Council Session on the Physics of Cancer* (Austin, TX, July 20–24, 2014).
38. *2014 SIAM Annual Meeting* (Chicago, IL, July 7–11, 2014);
https://meetings.siam.org/sess/dsp_talk.cfm?p=63691
39. *International HPC Summer School 2014 on HPC Challenges in Computational Sciences* (Budapest, Hungary, June 1–6, 2014).
40. *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

Invited Presentations at Other Institutions since 2013

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

41. *Tel Aviv University Department of Mathematics Seminar* (Tel Aviv, Israel, April 5, 2022), hosted by H. Avron and D. Batenkov.
42. *University of Southern California Ellison Institute for Transformative Medicine Seminar* (Santa Monica, CA, March 10, 2022), hosted by A. D. Barker.

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

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

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

54. *Genentech, Inc. Research Seminar* (South San Francisco, CA, November 6, 2014), hosted by M. J. Brauer.
55. *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
56. *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

57. S. P. Ponnappalli and **O. Alter**, “Tensor and Higher-Order Generalizations of the GSVD with Applications to Personalized Cancer Medicine,” *2022 SIAM Conference on Mathematics of Data Science (MDS22)* (San Diego, CA, September 26–30, 2022).
58. 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
59. 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

60. 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

Invited Colloquia and Seminars at Other Institutions 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.

Research Grants and Contracts

<https://alterlab.org/research>

Principal Investigator (PI)

Current Projects

	Grant	PI	Sponsor	Period	Total	Share
1.	U01 CA-202144	<u>O. Alter</u>	NIH/NCI	9/23/2015–8/31/2022	\$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/						
2.	75D301 21C11016	<u>O. Alter</u>	CDC	5/15/2021–5/14/2022		\$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.		<u>O. Alter</u>	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						

Completed Projects

1.	CAREER DMS-0847173	<u>O. Alter</u>	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						
2.	R01 HG-004302	<u>O. Alter</u>	NIH/NHGRI	8/23/2007–5/31/2015	\$1,768,525	\$1,691,848
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						
3.	K01 HG-00038	<u>O. Alter</u>	NIH/NHGRI	4/1/2000 –3/31/2005	\$527,367	\$527,367
NIH/National Human Genome Research Institute (NHGRI) K01 Individual Mentored Research Scientist Development Award in Genomic Research and Analysis: Mathematical Tools for Genome-Wide Gene Expression Data Analysis						
4.	FG03 99ER62836	<u>O. Alter</u>	DOE/Sloan	9/1/1999 –8/31/2003	\$100,000	\$100,000
DOE/Sloan Foundation Postdoctoral Fellowship in Computational Molecular Biology: Analytical and Computational Tools for Genome-Wide Gene Expression Data Analysis						

Subcontractor

Completed Projects

	Grant	PI	Sponsor	Period	Total	Share
1.	UL1 TR-001067	D. A. McClain and C. L. Byington	NIH/NCATS	1/1/2015–12/31/2016		\$25,000
National Center for Advancing Translational Sciences (NCATS) UL1 Center for Clinical and Translational Science (CCTS) Subcontract: Multi-Tensor Decompositions for Personalized Astrocytoma Brain Cancer Diagnostics and Prognostics						

Co-Mentor on Completed Individual Training Grants

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

Co-Mentor on Completed Individual Training Grants (continued)

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

Co-Mentor on Current University Training Grants

	Grant	PI/Co-Mentee	Sponsor	Period	Total
1.	R25 HG-009886	H. J. Yost	NIH/NHGRI	9/1/2018 –6/29/2023	\$1,311,390
NHGRI R25 Genomics Summer Research for Minorities					

Mentoring

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

Senior Industrial Affiliate and Ph.D. Alumna

	Mentee	Department	Completion Date
1.	Sri Priya Ponnappalli	Electrical and Computer Engineering	8/2010
	Current:	Director, Applied Science, and Leader, Machine Learning Solutions Lab, Amazon Web Services, Faculty, Rutgers Business School, and CEO and Co-Founder, Eigengene, Inc. (Palo Alto, CA);	
	Interview:	https://linkedin.com/in/priya-ponnapalli-b6342727/ 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:	Vice President, Systems Biology, Sage Bionetworks (Seattle, WA); https://linkedin.com/in/larsson-omberg-75912610	
	Placement:	Postdoctoral Fellow, Biological Statistics and Computational Biology, Cornell University (Ithaca, NY)	
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:	Director, Strategic Planning, Molecular Templates, Inc. (Sudbury, MA); https://linkedin.com/in/cmuralidhara/	

B.Sc. Alumni

	Mentee	Department	Completion Date
1.	Joel R. Meyerson	Biomedical Engineering and Government	5/2007
	Current:	Assistant Professor, Physiology and Biophysics, Weill Cornell Medicine (New York, NY); https://linkedin.com/in/joel-meyerson-699628196/	
	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, Invitae (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: Director, Machine Learning, Branded Entertainment Network, Inc. (Salt Lake City, UT); https://linkedin.com/in/nicolas-bertagnolli-058aba81/		

Co-Mentoring**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		

K12/K07 Research Assistant Professor Alumnus

1.	Heidi A. Hanson	Utah Population Database (UPDB)	6/2021
	Award: NIH/NCI K07 Mentored Cancer Prevention, Control, Behavioral and Population Sciences Career Development Award Award: NIH/NICHHD K12 Mentored Clinical Scientist Development Award		

F99 Predoctoral Alumnus

1.	Rosalie G. Waller	Biomedical Informatics	8/2020
	Award: NIH/NCI F99 Predoctoral to Postdoctoral Fellow Transition Award		

Teaching

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

4/2014– Founding Chair, Computational Systems and Synthetic Bioengineering Graduate Track;
<https://bme.utah.edu/graduate-program-overview/track-in-computational-systems-and-synthetic-bioengineering/>

Courses

8/2018– Founding Instructor, Data Science for Bioengineers;
<https://alterlab.org/teaching/BME6780/>

1/2006– Founding Instructor, Genomic Signal Processing;
<https://alterlab.org/teaching/BME6770/>

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

Core courses in the Computational Systems and Synthetic Bioengineering Graduate Track and an elective course 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 in student evaluations.

8/2012–12/2016

Instructor, Statistics for Bioengineers.

Required course for Department of Bioengineering undergraduates; cross-listed as a graduate-level course for students of engineering, sciences, and medicine; taught from a data science perspective to up to 100 students per semester.

Courses (continued)

1/2012– 5/2016

Co-Instructor, Applied Genomics.

Taught a section on genomic signal processing in this core course in the School of Medicine Genome Sciences certificate; consistently above the College of Pharmacy average instructor ratings in student evaluations.

5/2014 Invited 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

Co-Instructor with R. A. Horn, Seminar on Matrix Analysis.

Lectures by Guests of the Alter Lab YouTube Playlist:

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

Seminars

1. 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).
2. Linda M. Liao, 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).
3. 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).
4. 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).
5. 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).
6. 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: <https://youtu.be/oENp857ATYo>
7. 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: <https://youtu.be/6QZDLUwBXro>
8. 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).
9. 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)

10. 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: <https://youtu.be/5JI6dD-5GkI>
11. 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: <https://youtu.be/Eh-yfFcG8rs>
12. 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
13. 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: https://youtu.be/Z36AwoLh_ic
14. 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: <https://youtu.be/GU7m4oNalsM>
15. 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: <https://youtu.be/mGN3zmK3lsU>
16. 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
17. 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).
18. 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. "XSVD (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

Professional Activities and Service mostly since 2013

- 11/2020 Invited Member, Program Committee, "6th National Cancer Institute (NCI) Computational Approaches for Cancer Workshop," *Supercomputing 2020 (SC20) Virtual*
- 9/2020 Invited Co-Organizer, Virtual Symposium, *Decade of the Physical Sciences in Oncology Network (PS-ON) at the NCI*

Professional Activities and Service mostly since 2013 (continued)

- 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;
<https://www.abstractsonline.com/pp8/#!/9045/session/250>
- 9/2019 Invited Co-Organizer, Symposium, *NCI Physical Sciences in Oncology* (Minneapolis, MN)
- 1/2019–12/2019 Appointed Co-Chair, Steering Committee, PS-ON, NCI, NIH
- 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 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);
<https://www.math.hkbu.edu.hk/siam-ala18/Invited.html>
- 6/2017, 6/2016, 6/2015, 6/2014 Invited Mentor, *International High-Performance Computing (HPC) Summer School on HPC Challenges in Computational Sciences* (Boulder, CO; Ljubljana, Slovenia; Toronto, Canada; Budapest, Hungary)
- 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
- 6/2015– Appointed Member, Steering Committee, PS-ON, NCI, NIH
- 9/2014 Invited Co-Organizer and Panelist, International Conference Panel, "Translational Bioinformatics," 5th Association for Computing Machinery (ACM) Conference on Bioinformatics, Computational Biology and Health Informatics (ACM-BCB) (Newport Beach, CA);
<https://cse.buffalo.edu/ACM-BCB2014/panel.html>
- 7/2014 Invited Organizer, Three-Session Minisymposium, "Discovery from Data:"
"I. Mathematical Patterns in Nature;"
https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=18977
"II. Cancer Genomic Signals and Systems;"
https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=18981
and "III. Decompositions for Big Data Applications;"
https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=18983
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
- 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

Professional Activities and Service mostly since 2013 (continued)

- 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);
https://mtns.papercept.net/conferences/conferences/MTNS06/program/MTNS06_ContentListWeb_2.html#tup10
- 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://www.genome.gov/11006874/vision-acknowledgements>
- 9/1995– Reviewer, Journals, e.g., *American Statistical Association (ASA) Data Science Journal*, *Applied Physics Letters (APL) Bioengineering*, *BMC Bioinformatics*, *BMC Systems Biology*, *Communications of the 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)*, *Royal Society of Chemistry (RSC) Molecular Biosystems*, *Molecular Systems Biology (MSB)*, *Nature*, *Nature Biotechnology*, *Nucleic Acids Research*, *Proceedings of the National Academy of Sciences (PNAS) USA*, *PLoS Biology*, *PLoS Genetics*, *PLoS One*, *Science Signaling*, *Scientific Reports*, *SIAM Journal on Matrix Analysis and Applications*

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

- 10/2021– Member, Seed Grant Review Committee
- 2/2018– Invited Mentor, Women (and Minority) in Computing Graduate Students
- 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

- 8/2021– Member, Equity, Diversity, and Inclusion Committee
- 7/2018– Member, Bioengineering Track Chairs Teaching Committee
- 4/2014– Founding Chair, Computational Systems and Synthetic Bioengineering Graduate Track;
<https://bme.utah.edu/graduate-program-overview/track-in-computational-systems-and-synthetic-bioengineering/>