

Anna Ritz

Biology Department
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Research Interests: Computational reconstruction of cellular signaling pathways; graph and hypergraph representations of biological systems; computational detection of structural variants; next- and third-generation sequence data analysis.

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Publications–[1](#); Honors–[4](#); Funding–[4](#); Presentations–[5](#); Pedagogy–[8](#); Teaching & Mentoring–[9](#); Service–[12](#)

Education

- Dec 2012 **Ph.D. Computer Science**, Brown University, Providence, RI.
Algorithms for Identifying Structural Variants in Human Genomes. [\[pdf\]](#)
Dissertation Advisor: Benjamin Raphael.
- May 2008 **Sc.M. Computer Science**, Brown University, Providence, RI.
A Minimum Description Length Approach to the Multiple Motif Problem. [\[pdf\]](#)
Sc.M. Advisor: Benjamin Raphael.
- Jun 2006 **B.A. Computer Science**, *Magna cum laude*, Carleton College, Northfield, MN.
Senior Comprehensive Project: *A Language to Construct Graphical User Interfaces.* [\[link\]](#)

Experience and Affiliations

- Jul 2020–Present **Associate Professor**, Biology Department, Reed College, Portland, OR.
- Feb 2020–Present **NSF ASCEND Faculty Fellow** (four-year participant in an NSF ADVANCE award)
- Jul 2018–Present **Visiting Scholar**, Computational Biology Program, Oregon Health & Science University (OHSU), Portland, OR.
- Aug 2015–Jul 2020 **Assistant Professor**, Biology Department, Reed College, Portland, OR.
- Dec 2012–Aug 2015 **Postdoctoral Research Associate**, Department of Computer Science, Virginia Tech, Blacksburg, VA. Sponsor: T. M. Murali.
- Jan 2012–May 2012 **Instructor**, Department of Computer Science, Brown University, Providence, RI.

Research Publications

*Undergraduate or recently-graduated co-author. **High school co-author. †Joint first authors. ‡Joint last authors.

Submitted and In-Preparation Manuscripts

1. Hui-wen Lue, Daniel Derrick, Soumya Rao, Anna Van Gaest, Larry Cheng, Jennifer Podolak, Samantha Lawson, Changhui Xue, Devin Garg, Ralph White III, Christopher Ryan, Justin Drake, **Anna Ritz**, Laura M Heiser, George V Thomas. Development of combination therapies to induce durable responses in kidney cancers. *Submitted to Cell Reports Medicine.* [\[bioRxiv\]](#)

Peer-Reviewed Journal [**J**] and Conference [**C**] Publications (for pedagogy publications see page 8)

- [**J1**] Amy Platenkamp, Elizabeth Detmar, Liz Sepulveda, **Anna Ritz**, Stephen L. Rogers, and Derek A. Applewhite. The *Drosophila melanogaster* Rab GAP RN-tre Regulates Non-muscle Myosin II Localization and Function through the Rho Pathway. *Molecular Biology of the Cell*. 2020. [[Epub ahead of print](#)]
- [**C1**] Tobias Rubel* and **Anna Ritz**. Augmenting Signaling Pathway Reconstructions. *11th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM-BCB)* 2020. [[bioRxiv](#)]
- [**C2**] Ananthan Nambiar*, Maeve Hefflin*, Simon Liu*, Sergei Maslov, Mark Hopkins[‡], and **Anna Ritz**[‡]. Transforming the Language of Life: Transformer Neural Networks for Protein Prediction Tasks. *ACM-BCB* 2020, Virtual. [[bioRxiv](#)]
- [**J2**] Oscar L. Rodriguez, **Anna Ritz**, Andrew J. Sharp, and Ali Bashir. MsPAC: A Tool for Haplotype-phased Structural Variant Detection. *Bioinformatics* 2020. 36(3):922-924 [[publisher link](#)]
- [**J3**] Zach DiNardo*[†], Kiran Tomlinson*[†], **Anna Ritz**, and Layla Oesper. Distance Measures for Tumor Evolutionary Trees. *Bioinformatics* 2020. 36(7):2090-2097. [[publisher link](#)]
- [**C3**] Extended version of full paper from the *RECOMB Satellite Workshops on Computational Cancer Biology (RECOMB-CCB)* 2019, Washington D.C., USA. [[bioRxiv](#)]
- [**C4**] Alexander King*, Ibrahim Youssef, and **Anna Ritz**. Factors Affecting Network-Based Gene Prediction Across Diverse Diseases. *10th Workshop on Integrative Data Analysis in Systems Biology (IDASB)* 2019, San Diego, CA, USA. [[publisher link](#)]
- [**J4**] Nicholas Franzese*, Adam Groce, T. M. Murali, and **Anna Ritz**. Hypergraph-based Connectivity Measures for Signaling Pathway Topologies. *PLOS Computational Biology* 2019 Oct 25;15(10):e1007384. [[pub. link](#)]
- [**C5**] Invited for special issue based on full paper from the *Great Lakes Bioinformatics Conference (GLBio)* 2019, Madison, WI, USA. [[bioRxiv](#)]
- [**J5**] Ibrahim Youssef, Jeffrey Law, and **Anna Ritz**. Integrating Protein Localization with Automated Signaling Pathway Reconstruction. *BMC Bioinformatics* 2019. 20(505). [[publisher link](#)] [[bioRxiv](#)]
- [**C6**] Extended version of full paper from the *International Conference on Bioinformatics and Biomedicine (BIBM)* 2018, Madrid, Spain. [[proceedings](#)]
- [**C7**] Marika Swanberg*, Ira Globus-Harris*, Iris Griffith*, **Anna Ritz**, Adam Groce, and Andrew Bray. Improved Differentially Private Analysis of Variance. *19th Privacy Enhancing Technologies Symposium (PETS)* 2019, Stockholm, Sweden. [[proceedings](#)] [[arXiv](#)]
- [**J6**] Miriam Bern*[†], Alexander King*[†], Derek A. Applewhite, and **Anna Ritz**. Network-Based Prediction of Polygenic Disease Genes Involved in Cell Motility. *BMC Bioinformatics* 2019, 20(12), 313. [[publisher link](#)]
- [**C8**] Invited for special issue based on full paper from the *5th International Workshop on Computational Network Biology: Modeling, Analysis, and Control (CNB-MAC)* 2018, Washington D.C., USA.
- [**J7**] Kimberly A. Peters, Elizabeth Detmar, Liz Sepulveda, Corrina Del Valle*, Ruth Valsquier*, **Anna Ritz**, Stephen L. Rogers, and Derek A. Applewhite. Establishment of a cell-based assay to investigate non-muscle myosin II contractility via the Folded-gastrulation signaling pathway in *Drosophila* S2R+ cells. *Journal of Visualized Experiments (JoVE)* 2018, (138), e58325. [[publisher link](#)]
- [**C9**] Zachary Campbell*, Andrew Bray, **Anna Ritz**, and Adam Groce. Differentially Private ANOVA Testing. *1st International Conference on Data Intelligence and Security (ICDIS)* 2018, South Padre Island, TX, USA. [[proceedings](#)] [[arXiv](#)]

- [J8] Hui-wen Lue, Jennifer Podolak, Kevin Kolahi, Larry Cheng, Soumya Rao, Devin Garg, Chang-Hui Xue, Juha Rantala, Jeffrey Tyner, Kent Thornburg, Ann Martinez-Acevedo, Jen-Jane Liu, Christopher Amling, Charles Truillet, Michael Evans, Valerie O'Donnell, Daniel Nomura, Justin Drake, **Anna Ritz**, and George Thomas. Metabolic Reprogramming Ensures Cancer Cell Survival Despite Oncogenic Signaling Blockade. *Genes & Development*, 2017 Oct 15;31(20):2067-2084. [[publisher link](#)]
- [J9] Aditya Bharadwaj, Divit P. Singh, **Anna Ritz**, Allison N. Tegge, Christopher L. Poirel, Pavel Kraikivski, Neil Adames, Kurt Luther, Shiv D. Kale, Jean Peccoud, John J. Tyson, and T. M. Murali. GraphSpace: Stimulating Interdisciplinary Collaborations in Network Biology. *Bioinformatics* 2017. 33(19):3134–3136. [[publisher link](#)]
- [J10] **Anna Ritz**, Brendan Avent*, and T. M. Murali. Pathway Analysis with Signaling Hypergraphs. *IEEE Transactions on Computational Biology and Bioinformatics (TCBB)*, 15(5):1042–1055, 2017. [[pub. link](#)]
- [C10] Extended version of full paper from the *ACM-BCB* 2014, Newport Beach, CA, USA. [[proceedings](#)]
- [J11] **Anna Ritz**, Christopher L. Poirel, Allison N. Tegge, Nicholas Sharp*, Allison Powell*, Kelsey Simmons*, Shiv Kale, and T. M. Murali. Pathways on Demand: Automated Reconstruction of Human Signaling Networks. *NPJ Systems Biology and Applications*, 2:16002, 2016. [[publisher link](#)]
- [J12] **Anna Ritz**, Ali Bashir, Suzanne Sindi, David Hsu, Iman Hajirasouliha, and Benjamin J. Raphael. Characterization of Structural Variants with Single Molecule and Hybrid Sequencing Approaches. *Bioinformatics* 2014. 30 (24): 3458-3466. [[publisher link](#)]
- [J13] **Anna Ritz**[†], Allison N. Tegge[†], Hyunju Kim, Christopher L. Poirel, and T. M. Murali. Signaling Hypergraphs. *Trends in Biotechnology*, 32(7), 356-362, 2014. [[publisher link](#)]
- [J14] Layla Oesper, **Anna Ritz**, Sarah J. Aerni, Ryan Drebin*, and Benjamin J. Raphael. Reconstructing Cancer Genome Organization. *BMC Bioinformatics* 2012. 13(Suppl 6):S10. [[publisher link](#)]
- [C11] Proceedings of the *RECOMB Satellite Workshop on Massively Parallel Seq. (RECOMB-seq)* 2012.
- [J15] Lulu Cao, Yiyuan Ding, Norris Hung, Kebin Yu, **Anna Ritz**, Benjamin J. Raphael, and Arthur R. Salomon. Quantitative Phosphoproteomics Reveals SLP-76 Dependent Regulation of PAG and Src Family Kinases in T Cells. *PLoS One* 2014. 7(10): e46725. [[publisher link](#)]
- [J16] Ashley Stuckey, Andrew Fischer, Daniel H. Miller, Sara Hillenmeyer, Kyu K. Kim, **Anna Ritz**, Rakesh K Singh, Benjamin J Raphael, Laurent Brard and Alexander S. Brodsky. Integrated Genomics of Ovarian Xenograft Tumor Progression and Chemotherapy Response. *BMC Cancer* 2011. 11:308. [[publisher link](#)]
- [J17] **Anna Ritz**, Pamela L. Paris, Michael M. Ittmann, Colin Collins, and Benjamin J. Raphael. Detection of Recurrent Rearrangement Breakpoints from Copy Number Data. *BMC Bioinformatics* 2011. 12:114. [[pub.](#)]
- [C12] Proceedings of the *RECOMB Satellite Workshop on Comp. Cancer Biol. (RECOMB-CCB)* 2010.
- [J18] Trevor O'Brien, **Anna Ritz**, Benjamin J. Raphael, and David H. Laidlaw. Gremlin: An Interactive Visualization Model for Analyzing Genomic Rearrangements. *IEEE Transactions on Visualization and Computer Graphics* 2010. 16(6):918-26. [[publisher link](#)]
- [C13] Proceedings of the *IEEE Information Visualization Conference (InfoViz)* 2010.
- [J19] **Anna Ritz**[†], Ali Bashir[†], and Benjamin J. Raphael. Structural Variation Analysis with Strobe Reads. *Bioinformatics* 2010. 26(10): 1291-1298. [[publisher link](#)]
- [C14] Proceedings of the *Conference on High Throughput Sequencing Methods and App. (HiTSeq)* 2010.

- [J20] Deborah S Gross, Robert Atlas, Jeffrey Rzeszotarski, Emma Turetsky, Janara Christensen, Sami Benzaid, Jamie Olson, Thomas Smith, Leah Steinberg, Jon Sulman, **Anna Ritz**, Benjamin Anderson, Catherine Nelson, David R Musicant, Lei Chen, David C Snyder, James J Schauer. ENCHILADA: Environmental Chemistry through Intelligent Atmospheric Data Analysis. *Environmental Modelling & Software* 2010. 25(6):760-769. [[publisher link](#)]
- [J21] Vinh Nguyen, Lulu Cao, Jonathan T. Lin, Norris Hung, **Anna Ritz**, Kebin Yu, Radu Jianu, Samuel P. Ulin, Benjamin J. Raphael, David H. Laidlaw, Laurent Brossay, and Arthur R. Salomon. A New Approach for Quantitative Phosphoproteomic Dissection of Signaling Pathways Applied to T Cell Receptor Activation. *Molecular and Cellular Proteomics* 2009. 8: 2418-2431. [[publisher link](#)]
- [J22] **Anna Ritz**, Gregory Shakhnarovich, Arthur R. Salomon, and Benjamin J. Raphael. Discovery of Phosphorylation Motif Mixtures in Phosphoproteomics Data. *Bioinformatics* 2009. 25(1):14-21. [[publisher link](#)]
- [J23] Lulu Cao, Kebin Yu, Cindy Banh, Vinh Nguyen, **Anna Ritz**, Benjamin J. Raphael, Yuko Kawakami, Toshiaki Kawakami, and Arthur R. Salomon. Quantitative Time-Resolved Phosphoproteomic Analysis of Mast Cell Signaling. *Journal of Immunology* 2007. 179: 5864-5876. [[publisher link](#)]
- [C15] Benjamin J. Anderson, Deborah S. Gross, David R. Musicant, **Anna M. Ritz**, Thomas G. Smith, and Leah E. Steinberg. Adapting K-Medians to Generate Normalized Cluster Centers. *Proceedings of the Sixth SIAM International Conference on Data Mining (SDM)* 2006. pp165-175. [[proceedings](#)]

Other Publications and Reports

- [O1] Darsh Mandera** and **Anna Ritz**. An Ensemble Learning Approach for Cancer Drug Prediction, 2020. [[bioRxiv](#)]
- [O2] **Anna Ritz**. Algorithms for Identifying Structural Variants in Human Genomes. *Ph.D. Dissertation*, Brown University, 2012. [[pdf](#)]
- [O3] **Anna Ritz**. A Minimum Description Length Approach to the Multiple Motif Problem. *Sc.M. Thesis*, Brown University, 2008. [[pdf](#)]
- [O4] Benjamin J. Anderson, David R. Musicant, **Anna M. Ritz**, Andrew Ault, Deborah S. Gross, Melanie Yuen, Markus Gaelli. User-Friendly Clustering for Atmospheric Data Analysis. *Technical Report* 2005a, Carleton College, 2005. [[pdf](#)]

Honors and Awards

- May 2019 **Undergraduate Research Mentoring (URM) Award**, National Center for Women in Information & Technology (NCWIT). The URM Award recognizes faculty “for their outstanding mentorship, high-quality research opportunities, recruitment of women and minority students, and efforts to encourage and advance undergraduates in computing-related fields.” (\$5,000)
- May 2013 **Symbolic Ph.D. Recipient**, Brown University. The symbolic degree recipient is nominated to represent all Ph.D. recipients in the presentation of degrees by the President of the University.
- 2008–2011 **NSF Graduate Research Fellowship Program (GRFP)** Fellow (see *Past External Funding*).

Funding

Current External Funding

- Jun 2018–May 2023 **NSF Division of Biological Infrastructure (DBI) #1750981**
CAREER: Network-Based Signaling Pathway Analysis: Methods and Tools for Turning Theory into Practice. Principal Investigator (\$938,147)
- Aug 2017–Jul 2021 **NSF Division of Molecular and Cellular Biosciences (MCB) #1716964**
RUI: Investigating the Molecular Mechanisms of Non-muscle Myosin II Contractility
Co-Principal Investigator (with PI Derek Applewhite) (\$589,432)
- Aug 2018–Jul 2021 **NSF Division of Computer and Network Systems (CNS) #1817245**
SaTC: CORE: Small: RUI: Differentially Private Hypothesis Testing
Co-Principal Investigator (with PI Adam Groce and co-PI Andrew Bray) (\$344,684)
- Jul 2018– Jun 2021 **NIH National Institute of General Medical Sciences (NIGMS)**
Mouth-brooding: a Teleost Adaptation as a Tractable Model of Metabolic Disorder
Senior Personnel (with PI Suzy Renn) NIH R15 (\$419,497)

Past External Funding

- May 2016–Aug 2019 **M.J. Murdock Charitable Trust (College Research Program for Nat. Sciences)**
Developing Computational Methods to Identify Candidate Driver Genes Involved in Signaling Pathway Dysregulation in Colorectal Cancer
Principal Investigator (\$41,500)
- May 2016–Apr 2019 **M.J. Murdock Charitable Trust**
Investigating Cellular & Molecular Mechanisms of Neurogenesis in the Developing Zebrafish
Multi-Institutional Award to Reed College, Whitworth University, & Lewis & Clark College.
Co-Principal Investigator (with PI Kara Cerveney at Reed) (\$240,000)
- Sep 2017–Aug 2018 **CRA Collaborative Research Experience for Undergraduates (CREU)**
Graph-Based Semi-Supervised Learning to Predict Genes Associated with Schizophrenia
Principal Investigator (\$7,500); Summer Extension Awarded (\$8,000)
- Sep 2016–Oct 2017 **NSF Division of Computing and Communication Foundations (CCF) #1643361**
A Course-Based Undergraduate Conference Experience in Computational Biology
Principal Investigator (\$13,562)
- Jun 2008–May 2011 **NSF Graduate Research Fellowship Program (GRFP)**
An Integrated View of Signaling Pathways
Mentor: Benjamin Raphael (\$90,000)

Other Funding and Travel Awards

- Nov 2019 Reed College Stillman Drake award for travel support to University of Texas, El Paso (UTEP) (\$640); *rescheduled due to COVID-19*
- Nov 2018 Reed College Stillman Drake award for travel support to BIBM 2018 (\$1,200)
- May 2017 Reed Faculty Development Funds to support student research in computer science (\$1,500)
- Mar 2017 SIGCSE 2017 Travel Grant (\$500)
- May 2016 Reed Faculty Development Funds for travel to visit collaborators (\$1,500)

Presentations

* Undergraduate or recently-graduated co-author. ** High school co-author. Presenter.

Invited Talks

- Oct 2020 Department of Computer Science, Willamette University
- Mar 2020 Department of Computer Science, University of Texas El-Paso (UTEP); *rescheduled due to COVID-19*
ACM Student Chapter, Lewis & Clark College
- Oct 2019 Department of Mathematics and Statistics, Washington State University Vancouver
- Sep 2019 Biology Department, Reed College
- Aug 2019 Pacific Northwest Quantitative Biology (PacNoW QB) Symposium, OHSU
- Feb 2019 Computer Science & Biology Departments, Rhodes College
- Sep 2018 Pacific Northwest Quantitative Biology (PacNoW QB) Symposium, Lewis & Clark College
- Oct 2017 Systems Science Department, Portland State University
Biology Department, Lewis & Clark College
- Oct 2016 Department of Mathematics and Statistics, Washington State University Vancouver
- Jun 2016 Department of Computer Science, Carleton College
- May 2016 Department of Computer Science, Virginia Tech
- May 2015 ICTAS Center for Systems Biology of Engineered Tissues, Virginia Tech
- Apr 2015 Biology Department, Reed College
- Mar 2015 Society for Industrial and Applied Mathematics (SIAM) Seminar, Virginia Tech
- Feb 2015 Department of Computer Science, University of Kansas
- Jan 2015 BioFrontiers Institute, University of Colorado Boulder
- Dec 2014 Biology Department, Reed College
- Nov 2014 Department of Computer Science, University of Arizona
- Oct 2014 Department of Computer Science, Virginia Tech
- Oct 2013 Department of Computer Science, Carleton College
- Aug 2012 Cambridge Healthtech Institute's Next-Gen Sequencing Data Analysis Conference, Providence, RI
Department of Biochemistry and Molecular Genetics, University of Virginia
Department of Genetics and Genomics Sciences, Icahn School of Medicine at Mount Sinai
- July 2012 Department of Computer Science, Simon Fraser University
Department of Computer Science, Virginia Tech

Conference and Workshop Oral Presentations

- Sep 2020 Tobias Rubel* and **Anna Ritz**. Augmenting Signaling Pathway Reconstructions. *11th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM-BCB)*.
- Sep 2020 Ananthan Nambiar*, Maeve Heflin*, Simon Liu*, Sergei Maslov, Mark Hopkins[‡], and **Anna Ritz**[‡]. Transforming the Language of Life: Transformer Neural Networks for Protein Prediction Tasks. *ACM-BCB*.
- Nov 2019 Alexander King*, Ibrahim Youssef, and **Anna Ritz**. Factors Affecting Network-Based Gene Prediction Across Diverse Diseases. *Workshop on Integrative Data Analysis in Systems Biology (IDASB)*.
- Jul 2019 Marika Swanberg*, Ira Globus-Harris*, Iris Griffith*, **Anna Ritz**, Adam Groce, and Andrew Bray. Improved Differentially Private Analysis of Variance. *The 19th Privacy Enhancing Technologies Symposium (PETS)*.
- May 2019 Nicholas Franzese*, Adam Groce, T. M. Murali, and **Anna Ritz**. Hypergraph-Based Connectivity of Signaling Pathway Topologies. *Great Lakes Bioinformatics Conference (GLBio)*.
- May 2019 Zach DiNardo*, Kiran Tomlinson*, **Anna Ritz**, and Layla Oesper. Distance Measures for Tumor Evolutionary Trees. *RECOMB Satellite Workshop on Computational Cancer Biology (RECOMB-CCB)*.

- Dec 2018 Ibrahim Youssef, Jeffrey Law, and **Anna Ritz**. Integrating Protein Localization with Automated Signaling Pathway Reconstruction. *International Conference on Bioinformatics and Biomedicine (BIBM)*.
- Aug 2018 Miriam Bern*, Alexander King*, Derek A. Applewhite, and **Anna Ritz**. Network-Based Prediction of Polygenic Disease Genes Involved in Cell Motility. *5th International Workshop on Computational Network Biology: Modeling, Analysis, and Control (CNB-MAC)*.
- Apr 2018 Zachary Campbell*, Andrew Bray, **Anna Ritz**, and Adam Groce. Differentially Private ANOVA Testing. *International Conference on Data Intelligence and Security (ICDIS)*.
- Dec 2017 Ibrahim Youssef and **Anna Ritz**. Integrating Protein Localization Information in Signaling Pathway Reconstructions. *15th Annual Rocky Mountain Bioinformatics Conference (ROCKY)*.
- Nov 2014 **Anna Ritz**, Christopher L. Poirel, Allison N. Tegge, Nicholas Sharp*, Allison Powell*, Kelsey Simmons*, Shiv Kale, and T. M. Murali. Pathways on Demand: Automated Reconstruction of Human Signaling Networks. *Seventh Annual RECOMB/ISCB Conference on Regulatory and Systems Genomics (RECOMB-RegSysGen)*.
- Sep 2014 **Anna Ritz** and T. M. Murali. Pathway Analysis with Signaling Hypergraphs. *ACM-BCB*.
- July 2014 **Anna Ritz**, Ali Bashir, Suzanne Sindi, David Hsu, Iman Hajirasouliha, and Benjamin J. Raphael. Characterization of Complex Structural Variants with Single Molecule and Hybrid Sequencing Approaches. *Conference on High Throughput Sequencing Algorithms & Applications (HiTSeq)*.
- Nov 2011 **Anna Ritz**. Algorithms for Identifying Structural Variants in Human Genomes. *Grace Hopper Celebration for Women in Computing*.
- Sep 2010 **Anna Ritz**, Ali Bashir, Suzanne Sindi, and Benjamin J. Raphael. Algorithms for Resequencing and Assembly using Strobe Sequencing Data. *Cold Spring Harbor Personal Genomes Meeting*.
- July 2010 **Anna Ritz**, Ali Bashir, and Benjamin J. Raphael. Structural Variation Analysis with Strobe Reads. *Conference on High Throughput Sequencing Algorithms & Applications (HiTSeq)*.
- June 2010 **Anna Ritz**, Pamela L. Paris, Michael M. Ittmann, Colin Collins, and Benjamin J. Raphael. Detection of Recurrent Rearrangement Breakpoints from Copy Number Data. *RECOMB-CCB*.
- April 2006 Benjamin J. Anderson, Deborah S. Gross, David R. Musicant, **Anna Ritz**, Thomas G. Smith, and Leah E. Steinberg. Adapting K-Medians to Generate Normalized Cluster Centers. *SIAM International Conference on Data Mining (SDM)*.

Conference and Workshop Poster Presentations (since becoming faculty at Reed in 2015)

- Sep 2020 Gabriel Preising*, Joshua Faber-Hammond, Suzy Renn, and **Anna Ritz**. A Protein-Protein Interactome for an African Cichlid. *ACM-BCB*.
- Sep 2020 Yuan Zhuang*, Kara Cerveny, and **Anna Ritz**. Prefix/Suffix Variation in Retinoic Acid Response Elements. *ACM-BCB*.
- Sep 2020 Heyuan Zeng* and **Anna Ritz**. Graphery: a Biological Network Algorithm Tutorial Webservice. *ACM-BCB*.
- Dec 2019 Darsh Mander* and **Anna Ritz**. Effective Targeted Drug Prediction for Cancer Based on Genetic Mutations. *17th Annual Rocky Mountain Bioinformatics Conference (ROCKY)*.
- Nov 2019 Tayla Isensee*, Kara Cerveny, and **Anna Ritz**. Finding RARE Genes: Developmental Neurogenesis and Retinoic Acid. *Murdock College Science Research Conference (MCSR)*.
- Sep 2019 Amy R. Lazarte*, Samuel F. Fey, and **Anna Ritz**. Modeling Phytoplankton Movement and Fitness in Lakes. *ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM-BCB)*.
- Aug 2019 Jiarong Li*, Tunc Basar Kose*, Ibrahim Youssef, and **Anna Ritz**. Reconstructing Signaling Pathways with DAGs. *Pacific Northwest Quantitative Biology (PacNoW QB) Symposium*.
- July 2019 Ananthan Nambiar*, Mark Hopkins and **Anna Ritz**. Computing the Language of Life: NLP Ap-

- proaches to Feature Extraction for Protein Family Classification. *27th Conference on Intelligent Systems for Molecular Biology and the 18th European Conference on Computational Biology (ISMB/ECCB)*.
- July 2019 Zach DiNardo*, Kiran Tomlinson*, **Anna Ritz**, and Layla Oesper. Distance Measures for Tumor Evolutionary Trees. *ISMB/ECCB*.
- July 2019 Nicholas Franzese*, Adam Groce, T. M. Murali, and **Anna Ritz**. Hypergraph-Based Connectivity of Signaling Pathway Topologies. *ISMB/ECCB*.
- May 2019 Zach DiNardo*, Kiran Tomlinson*, **Anna Ritz**, and Layla Oesper. Distance Measures for Tumor Evolutionary Trees. *23rd Research in Computational Molecular Biology Conference (RECOMB)*.
- Dec 2018 Amy Platenkamp, Elizabeth Detmar, Liz Selpuveda, **Anna Ritz**, Stephen L. Rogers, and Derek A. Applewhite. The *Drosophila melanogaster* Rab GAP RN-tre plays a role in regulating non-muscle myosin II localization and function. *American Society for Cell Biology / European Molecular Biology Organization Meeting (ASCB/EMBO)*.
- Dec 2018 Madelyn O'Kelley-Bangsberg*, Tamar Conner*, David Noeckel*, Luke Steiger*, Karl Young*, **Anna Ritz**, and Derek A. Applewhite. From network analysis to experimental validation: identification of regulators of non-muscle myosin II contractility using the folded-gastrulation signaling pathway. *ASCB/EMBO*.
- Nov 2018 Sol Taylor-Brill*, Kathy Thompson*, and **Anna Ritz**. CancerLinker: Integrating Gene Expression for Pathway Analysis. *Murdock College Science Research Conference (MCSRC)*.
- Jul 2018 Ibrahim Youssef and **Anna Ritz**. Integrating Protein Localization with Automated Signaling Pathway Reconstruction. *ISMB*.
- Jun 2018 **Anna Ritz**, Brendan Avent, Aditya Pratapa and T. M. Murali. The Hypergraph Algorithms Package. *The Bioinformatics Open Source Conference (BOSSC)*.
- Dec 2017 Ibrahim Youssef and **Anna Ritz**. Integrating Protein Localization Information in Signaling Pathway Reconstructions. *ROCKY*.
- Nov 2017 Nick Egan* and **Anna Ritz**. PepperPathway: Visualizing Proteins of Influence in Cancer Pathways. *Murdock College Science Research Conference (MCSRC)*.
- Aug 2017 Ibrahim Youssef and **Anna Ritz**. Breaking Ties in Weighted Interactomes. *ACM-BCB*.
- July 2017 Nicholas Franzese*, Barney Potter*, Adam Groce, James Fix, and **Anna Ritz**. Hyperpath Relaxations for Signaling Pathway Analysis. *ISMB/ECCB*.
- Oct 2016 Nicole Ezell* and **Anna Ritz**. Reconstructing Neuronal Signaling Pathways With the Potential for Disruption in Schizophrenia. *ACM-BCB*.
- Oct 2016 Karl Menzel*, Suzy C.P. Renn, and **Anna Ritz**. Copy Number Variation and Adaptive Evolutionary Radiations across the African Cichlid phylogeny. *ACM-BCB*.
- Oct 2016 Barney Potter*, James Fix, and **Anna Ritz**. Modeling Cell Signaling Networks with Prize-Collecting Subhypernetworks. *ACM-BCB*. **Best Poster Award**.

Pedagogy

* Undergraduate or recently-graduated co-author. *Presenter*.

Peer-Reviewed Pedagogy [P] Publications

- [P1] Amy R. Lazarte* and **Anna Ritz**. Lowering the Barrier to Learn about Computational Research through a Course-Based Conference Experience. *5th International Conference on Research in Equity and Sustained Participation in Engineering, Computing, and Technology (RESPECT) 2020*, Portland, OR, USA. To appear.
- [P2] **Anna Ritz**. Programming the Central Dogma: An Integrated Unit on Computer Science and Molecular Biology Concepts. *49th ACM Technical Symposium on Computer Science Education (SIGCSE) 2018*, Baltimore, MD, USA. [[proceedings \(open access\)](#)]

Talks and Panels

- Oct 2020 **Panel Organizer.** Haiyan Cheng, Shereen Khoja, **Anna Ritz**, and Tammy VanDeGrift. Supporting and Teaching Students at Liberal Arts Colleges in Online Courses. *Consortium for Computing Sciences in Colleges NorthWest (CCSC-NW)*.
- Mar 2020 **Selected Speaker.** Broadening Undergraduate Participation in STEM through Conference Attendance. *Supporting Undergraduate Research (SUR) Conference; canceled due to COVID-19*.
- Mar 2020 **Proceedings Talk.** Amy R. Lazarte* and **Anna Ritz**. Lowering the Barrier to Learn about Computational Research through a Course-Based Conference Experience. *5th Intl. Conference on Research in Equity and Sustained Participation in Engineering, Computing, and Technology (RESPECT)*.
- May 2019 **Invited Speaker.** Conference-based Undergraduate Experiences: Lowering the Barrier for Learning about Computational Biology. Education Track, Great Lakes Bioinformatics Conference (GLBio).
- May 2019 **Panelist,** Next Steps for the Bioinformatics Education Community. GLBio.
- Mar 2018 **Proceedings Talk.** **Anna Ritz**. Programming the Central Dogma: An Integrated Unit on Computer Science and Molecular Biology Concepts. *49th ACM Technical Symposium on Computer Science Education (SIGCSE)*.

Other Products

- Tutorial **Graphery: an Interactive Graph Algorithm Tutorial Website.** Accepted as a poster at ACM-BCB '20 (with student co-author Heyuan Zeng); part of NSF CAREER award. [[website](#)]
- Assignment **Nifty Assignment: Animal Social Network Visualization.** Submitted to the Western Canadian Conference on Computing Education (WCCE); *postponed due to COVID-19*. [[draft website](#)]
- Workshop **Computational Biology Workshop Module,** (Carleton College, Fall 2018) [[webpage](#)]
Finding friends in molecular interaction networks (1.5 hour undergraduate module).

Teaching

Teaching and guest lectures at Reed College unless denoted otherwise. [§]Partially virtual due to COVID-19.

Courses

- BIO131 **Introduction to Computational Biology** [[course website](#)] [[final projects](#)]
Spring 2020[§]; Spring 2018; Spring 2017; Spring 2016; Fall 2015.
- BIO211 **Introduction to Scientific Literature & Discourse**
Fall 2019.
- BIO331 **Computational Systems Biology** [[course website](#)] [[final projects](#)]
Fall 2020[§]; Fall 2019; Fall 2017; Fall 2016.
- BIO431 **Computational Cancer Biology** [[course website](#)]
Spring 2018; Spring 2017; Fall 2015.
- BIO431 **The Genetics and Cell Biology of Cancer**
Spring 2020[§].
- BIO481 **Independent Study**
Spring 2017 (1 student); Spring 2016 (2 students).
- CS0931 **Introduction to Computation for the Humanities and Social Sciences** [[course website](#)]
Brown University, Spring 2012.

Guest Lectures

- CS252 **Algorithms** (Carleton College, Spring 2020[§])
Network-based approaches for COVID-19 drug target prediction.
- BIO363 **Genes, Genetics, and Genomes** (Spring 2020; *Rescheduled due to COVID-19*)
Guest in an “Author not Ether” discussion.
- BIO372 **Cellular Biology** (Fall 2020[§]; Fall 2019; Spring 2019; Spring 2018)
Semi-supervised learning for protein function prediction.
(Co-taught three combined labs in Fall 2020).
- BIO101/102 **Topics in Biology** (Spring 2019; Spring 2018; Spring 2017)
Computational challenges of *de novo* assembly. Class size is typically 170–200 students.
- MATH243 **Statistical Learning** (Spring 2016).
Geometric analysis of structural variants.
- CS6824 **Hypergraph Algorithms and Applications** (Virginia Tech, Spring 2014)
Signaling hypergraph theory (two lectures).
- CS4014 **Data and Algorithm Analysis** (Virginia Tech, Spring 2014)
Greedy algorithms (three lectures).
- CS6604 **Computational Thinking** (Virginia Tech, Fall 2013)
Reflections on teaching computational courses to non-computational students.
- CS0931 **Introduction to Computation for the Humanities and Social Sciences** (Brown University, Fall 2011)
Introduction to Python programming.
- CSCI2950-C **Topics in Computational Biology** (Brown University, Fall 2011)
Structural variant detection.

Undergraduate Thesis Students

- 2020–2021 **Hannah Meier** (with Sam Fey in Biology). *In progress*.
Tayla Isensee (with Erik Zornik in Biology). *In progress*.
Delaney Brubaker (with Julia Michaels in Biology). *In progress*.
Jiarong Li (with Jim Fix in CS). *In progress*.
Aryeh Stahl (with David Ramirez in CS). *In progress*.
- 2019–2020 **Gabe Preising** (with Suzy Renn in Biology). *A Computational Network Approach to Examine Biological Crosstalk during Mouthbrooding in the Cichlid Astatotilapia burtoni*. → NIH NIGMS Diversity Supplements Program (DSP) postbac.
Sol Taylor-Brill (with Jay Mellies in Biology). *Computationally Analyzing the Effect of Cannabidiol on Enterohemorrhagic E. coli Using Transcriptomic Data*. → employee at Suvoda.
Madeline Doak (with Erik Zornik in Biology). *Sex-Biased Gene Expression in the Brain Conserved Among Taxa*. → employee at Suvoda.
- 2018–2019 **Alexander King**. *Multi-omic Analysis of Genetically Induced Conditions*. → Neuroscience PhD student at UC Riverside.
Miriam Bern (with Jeremy Coate in Biology). *A Comparison of Two Methods for Identifying Alternative Splicing in Diploid and Tetraploid Arabidopsis thaliana Strains*. → Broad Institute Postbac Scholar (BBPS).
Amy Rose Lazarte (with Sam Fey in Biology). *Just Keep Swimming: Resolving the Patterns and Dynamics of Body Temperature in Freshwater Phytoplankton*. → Software engineer at Puppet.
Ananthan Nambiar (with Mark Hopkins in CS). *Computing the Language of Life*. → Bioengineering PhD student at UIUC.

- 2017–2018 **Petra Wijngaard** (with Derek Applewhite in Biology). *How Cytoscounts Got Shot Out of Dr. Ritz's New Interactome*.
- 2016–2017 **Moira Differding** *Your Microbes are Super Models: Using Microbiome Data to Reproducibly Predict Crohn's Disease*. → MPH at Johns Hopkins → Epidemiology PhD Student at Johns Hopkins School of Public Health.
Nick Franzese (with Adam Groce in CS). *Examining the Practicality of Shortest Hyperpaths for Signaling Pathway Analysis: The Cheating Hyperpath Algorithm as an Alternative Approach*. → CS PhD student at UMD College Park → NSF GRFP Fellow → CS PhD student at Northwestern.
- 2015–2016 **Olivier Ezell**. *Pathway Models of Signal Dysregulation in Schizophrenia*. → Intern at White Bird Clinic → Medical school student at OHSU.
Cameron Shard Milne (with Sarah Schaack in Biology). *Identification of Transposable Element Subfamilies using a Phylogenetic Network Approach*. → Lab technician at UCSC → Environmental Studies Master's student at UW.
Barney Potter (with Jim Fix in CS). *Prize-Collecting Steiner Trees in Directed Signaling Hypergraphs*. → Research Assistant at Fred Hutch → CS PhD Student at KU Leuven (Belgium).

Mentoring

Mentoring at Reed College unless denoted otherwise. †Co-advised students.

Postdocs, Postbacs, Visiting Scholars, and Other Mentored Students

- Postdocs **Pramesh Singh** *Aug 2020–*
Ibrahim Youssef (Jan 2017–Dec 2019) → Assistant Professor of Systems and Biomedical Engineering at Cairo University, Cairo, Egypt.
- Postbacs **Tobias Rubel '19**, (Jan 2020–Present).
Amy Rose Lazarte† '19 (Summer 2019). → Software engineer at Puppet.
Alexander King '19 (Summer 2019) → Neuroscience PhD student at UC Riverside.
Nick Franzese '17 (Sep 2017–May 2018) → CS PhD student at UMD College Park → NSF GRFP Fellow → CS PhD student at Northwestern.
- Scholars **Ramin Neshati** (2016–2017). Visiting scholar through the Encore Fellows Program.
- High School **Darsh Mandera** (Sep 2017–Present). High school student in the Portland area.
- @VT **Divit Singh†** (2014–2015). Master's student at Virginia Tech → Software engineer at Xbox.
Craig Estep† (2013–2014). Master's student at Virginia Tech.
Amy Olex† (2013–2014). PhD student at Virginia Tech → Bioinformatics specialist at VCU.

Undergraduate Computational Biology Researchers

- Summer 2020 **Alex Richter** (Math/CS major).
Aryeh Stahl (Math/CS major).
Heyuan (Larry) Zeng (CS major).
Yuan (Frank) Zhuang (Biology major).
- Summer 2019 **Karl Young†** (Biology major).
Jiarong Li (Math/CS major).
Tayla Isensee† (Biology major).
Tunc Kose (Biology/CS interdisciplinary major).
- Summer 2018 **Alexander King†** (Neuroscience major) → Neuroscience PhD student at UC Riverside.
Miriam Bern† (Biology major) → Broad Institute Postbac Scholar (BBPS).
Sol Taylor Brill (Biology major). → employee at Suvoda.
Kathy Thompson (CS major).
Usman Hafeez (Math major).

- Summer 2017 **Nick Egan** (Sociology major).
Yurel Watson (CS major).
Giorlando Ramirez (Economics major). → Watson Fellow.
- Summer 2016 **Karl Menzel**[‡] (Biology major)
- 2014–2015 **Nicholas Sharp**[‡] (CS major at Virginia Tech) → CS PhD student at CMU.
Brendan Avent[‡] (CS major at Virginia Tech) → CS PhD student at USC.

Undergraduate Differential Privacy Researchers (co-advised with Adam Groce & Andrew Bray)

- Summer 2020 *Minimal advising due to COVID-19.*
- Summer 2019 **Wenxin Du**[‡], **Kaiyan Shi**[‡], **Canyon Foot**[‡], **Zeki Kazan**[‡], and **Monica Moniot**[‡].
- Summer 2018 **Simon Couch**[‡] → Goldwater Fellow, **Marika Swanberg**[‡] → CS PhD student at BU, **Iris Griffith**[‡], **Kaiyan Shi**[‡], **Ira Globus-Harris**[‡] → Software engineer at BU, and **Zeki Kazan**[‡].
- Summer 2017 **Zachary Campbell**[‡] → Software engineer at OppLoans.

Other Research Positions

- Summer 2020 **Jiarong Li**[‡], Cloud Computing Research Assistant. Supported by Instructional Technology Services (ITS) and jointly mentored with ITS Director Trina Marmarelli.

Service

Professional Organizations

- 2014–Present **SIGBio**: ACM Special Interest Group in Bioinformatics, Computational Biology and Biomedical Informatics
- 2012–Present **SIGCSE**: ACM Special Interest Group in Computer Science Education
- 2011–Present **ACM**: Association for Computing Machinery
- 2010–Present **ISCB**: International Society of Computational Biology

Professional Service

- 2019–Present **Organizer**, Undergraduate Travel Award, ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM-BCB)
- 2017–Present **Co-organizer**, Pacific Northwest Quantitative Biology Meeting (PacNowQB)
Co-chair, NSF Graduate Travel Awards, ACM-BCB
- 2020 **Proceedings Chair**, ACM-BCB 2020
Panelist, Computational Structural Biology Workshop at ACM-BCB 2020.
Program Committee, Conference on Intelligent Systems for Molecular Biology (ISMB)
- 2019 **Panelist**, ACM-BCB 2019)
Poster Prize Committee, Conference on Intelligent Systems for Molecular Biology and the European Conference on Computational Biology (ISMB/ECCB)
- 2018 **Scientific Program Committee**, Galaxy Community Conference (GCC)
- 2015, 2017–2018 **Program Committee**, ACM-BCB
- 2017 **Co-chair**, Biological Modeling track, ACM-BCB 2017
Program Committee, RECOMB Satellite Workshop on Massively Parallel Sequencing and Computational Cancer Biology (RECOMB-Seq/RECOMB-CCB)
- 2014–2015 **Program Committee**, Cancer Panomics session, Pacific Symposium on Biocomputing (PSB)

Session Chair: ACM-BCB 2016, 2017, 2019, 2020
 Computational Network Biology: Modeling, Analysis, & Control (CNB-MAC 2018, 2019)
 Great Lakes Bioinformatics Conference (GLBio 2019)

Journal Reviewer: Bioinformatics
 BioMed Central (BMC) Bioinformatics
 Frontiers in Genetics
 IEEE Transactions on Molecular, Biological, and Multi-Scale Communications (TMBMC)
 IEEE Transactions on Computational Biology and Bioinformatics (TCBB)
 Nature Publishing Group (NPG) Cell Death & Disease (CDDIS)
 PLOS Computational Biology
 PLOS One

Conference Reviewer: RECOMB, ISMB, RECOMB RSG, PSB; ACM-BCB

NSF Reviewer: Division of Undergraduate Education (DUE)
 Division of Human Resource Development (HRD)
 Division of Biological Infrastructure (DBI) – 2 panels
 NSF's Big Ideas (NSF-wide)

Service within Reed College

Mar 2020 **Workshop co-leader**, *Online Teaching in Math and the Natural Sciences*, Reed's Center for Teaching and Learning (CTL); *prepared in response COVID-19*.

Sep 2019 **Workshop co-leader**, *Teaching students with a wide range of preparation in STEM*, CTL.

Aug 2019 **Panelist**, Parent orientation curriculum panel

May 2016, 2017, 2018 **Panelist**, LADO Workshops at Stanford & UC-Davis about faculty careers in the liberal arts

May 2018 **Panelist**, Advising workshop for first-time faculty advisers

Mar 2016 **Panelist**, Open Access Panel as part of Reed's Digital Scholarship Week

Committees Committee on Diversity (2 years); Ad-Hoc Committee on Student Success; Alcohol and Other Drugs (AOD) Committee; AOD Review Panel; Bookstore Board; Computing Policy Committee (2 years)

Service with Underrepresented Groups in STEM

2017–Present **Regional Selection Committee**, National Center for Women and Information Technology (NCWIT) Aspirations in Computing Award for high school girls.
Reviewer, NCWIT Aspirations in Computing Award for high school girls.
Reviewer, NCWIT Collegiate Award for college women.

2015–Present **Reviewer**, Grace Hopper Celebration for Women in Computing (GHC) Scholarships.

2018 **Panelist**, Girls Inc. Eureka program visit to Reed, for high school girls interested in STEM.

2016–2018 **Poster Committee**, Grace Hopper Celebration for Women in Computing (GHC).

2015 **Session leader**, Women in Computing Day, Virginia Tech.

2013–2014 **Interim Faculty Advisor**, Association for Women in Computing (AWC), Virginia Tech.

2009–2011 **Coordinator**, Family Days Camp, International Institute of Rhode Island. Summer day camp for refugee children and their families in the Providence area.

2008–2009 **Guest Speaker**, Artemis Program, Brown University. Artemis is a day camp for entering ninth grade girls organized by Brown undergraduates. I gave talks on pattern finding and computational biology.