Luke Trinity

Postdoctoral Associate, Ucar Lab

The Jackson Laboratory for Genomic Medicine

10 Discovery Drive, Farmington, Connecticut 06032

Luke.trinity@jax.org

Education

Ph.D., Computer Science   **May 2024**
University of Victoria (UVic), BC, Canada

M.S., Complex Systems & Data Science   **Dec 2019**
University of Vermont (UVM)

B.A., Computer Science, Cum Laude   **May 2018**
University of Vermont

Experience

Postdoctoral Associate   **Sep 2024 – Present**
The Jackson Laboratory for Genomic Medicine, Farmington, CT
> Improving and applying novel systems immunology tools to analyze epigenomes and transcriptomes of human immune cells in unprecedented detail. Uncovering how epigenomes of human hematopoietic stem and progenitor cells change with age. Exploring the role of HSPCs in inflammaging observed among older adults that is behind many aging related diseases and uncover potential sex differences in HSPC aging.

Graduate Research Fellow   **Jan 2020 – Aug 2023**
Computation Biology Research & Analytics Lab (COBRA), Victoria, BC
> Sequence and structural analysis of RNA molecules especially coronaviruses. Partition function algorithm design and implementation, visualization of RNA secondary structure prediction, isolating stem cell differentiation pathways, and RNA-protein interaction.

Lead Software Developer   **Jun 2016 – Aug 2023**
Social Ecological Gaming & Simulation Lab, Burlington, VT
> Design and implement biosecurity compliance and agriculture water quality serious games using Unity and C#. Collect and analyze data to understand how information affects decisions in association with the Cooperative Institute for Research to Operations in Hydrology. Previous grants funded via the Animal Disease Biosecurity Coordinated Agricultural Project funded by United States Department of Agriculture (USDA), National Institute of Food and Agriculture; and for the Lake Champlain Basin Resilience to Extreme Events Project via the National Science Foundation in association with Vermont Established Program to Stimulate Competitive Research, North East Water Resource Network, UVM Extension, and the USDA Northeast Climate Hub.

Graduate Teaching Assistant   **Jan 2020 – Aug 2023**
UVic Computer Science Department, Victoria, BC
> Lab instruction and course administration of Computer Science and Software Engineering courses (Algorithms and Data Structures, Computers and Information Processing, Foundations of Computer Science, Fundamentals of Programming, Human-Computer Interaction). Accountable for generating course assignments and exam questions, delivering labs, and grading students to promote learning and retention of material.

Undergraduate Teaching Assistant & Tutor   **Jan 2014 – May 2018**
UVM Computer Science Department, Burlington, VT
> Provided students' feedback to promote learning and retention of material for Computer Science courses (Data Structures and Algorithms, Web Development). Delivered weekly computer science tutoring to a visually impaired student over multiple semesters. Exhibited patience and understanding of accessibility to create a productive learning environment.

Research Interests

Genomic Analyses ● Information Visualization ● Precision Gerontology
RNA Structure Prediction ● Social Ecological Systems ● Serious Game Design

Publications

Trinity, L., S. Will, Y. Ponty, H. Jabbari, U. Stege. (Accepted Sep 2024) CParty: Hierarchically constrained partition function for density-2 RNA pseudoknots. *bioRxiv*. DOI: 10.1101/2023.05.16.541023

Trinity, L., U. Stege, H. Jabbari. (2023) Tying the Knot: Unraveling the Intricacies of the Coronavirus Frameshift Pseudoknot. *PLOS Comp. Bio.* DOI: 10.1371/journal.pcbi.1011787

Trinity, L., I. Wark, L. Lansing, H. Jabbari, U. Stege. (2023) Shapify: Paths to SARS-CoV-2 Frameshifting Pseudoknot. *PLOS Comp. Bio*. DOI: 10.1371/journal.pcbi.1010922

Bucini, G., E. M. Clark, S. C. Merrill, O. Langle-Chimal, A. Zia, C. J. Koliba, N. Cheney, S. Wiltshire, **L. Trinity**, J. M. Smith (2023) Connecting livestock disease dynamics to human learning and biosecurity decisions. *Frontiers in Veterinary Science*. DOI: 10.3389/fvets.2022.1067364

Liu, Tung-Lin, S. C. Merrill, A. O'Keefe, E. M. Clark, O. Langle-Chimal, **L. Trinity**, T. Shrum, C. J. Koliba, A. Zia, T. L. Sellnow, D. D. Sellnow, J. Smith. (2022) Effects of Message Delivery on Cross-cultural Biosecurity Compliance: Insights from Experimental Simulations. *Frontiers in Veterinary Science*. DOI: 10.3389/fvets.2022.984945

Clark, E. M., S. C. Merrill, **L. Trinity**, T. Liu, A. O'Keefe, T. Shrum, G. Bucini, N. Cheney, O. Langle-Chimal, C. J. Koliba, A. Zia, J. M. Smith. (2022) Comparing behavioral risk assessment strategies for quantifying biosecurity compliance to mitigate agricultural disease spread. *Frontiers in Veterinary Science*. DOI: 10.3389/fvets.2022.962989

Trinity, L., A. Hollar, H. Greenyer, H. Jabbari, U. Stege. (2021) Viz23: Web Server for Visualization of Gene Expression and Locational Information. *IBM CASCON x EVOKE*. DOI: 10.5555/3507788.3507831

Nakhaei-Nejad, M.*, **L. Trinity***, H. Jabbari, M. Pasdar, N. Jahroudi. (2021) In silico analysis to explore lineage-independent and -dependent transcriptional programs associated with the process of endothelial and neural differentiation of human induced pluripotent stem cells. *Journal of Clinical Medicine.* *Authors contributed equally. DOI: 10.3390/jcm10184161

Trinity, L., L. Lansing, H. Jabbari, U. Stege. (2021) SARS-CoV-2 Ribosomal Frameshifting Pseudoknot: Detection of Inter-viral Structural Similarity. *IEEE International Conference on Healthcare Informatics*. DOI: 10.1109/ICHI52183.2021.00080

Merrill, S.C., Bucini, G., Clark, E.M., Koliba, C.J., **Trinity, L.**, Zia, A., Langle-Chimal, O., Cheney, N., Shrum, T.R., Sellnow, T., Sellnow, D.D., and Smith, J.M. (2021). Why we need to account for human behavior and decision-making to effectively model the non-linear dynamics of livestock disease. *Proceedings of the International Crisis and Risk Communication Conference*. DOI:10.30658/icrcc.2021.06

Merrill, S. C., **L. Trinity**, E. M. Clark, T. R. Shrum, C. J. Koliba, A. Zia, G. Bucini, T. L. Sellnow, D. D. Sellnow, J. M Smith. (2021) Message Delivery Strategy Influences Willingness to Comply With Biosecurity. *Frontiers in Veterinary Science.* DOI: 10.3389/fvets.2021.667265

Schattman, R., **L. Trinity**, E. M. Clark, S. C. Merrill. (2021) Awards: Untapped motivation for agricultural conservation behavior. *Elementa*. DOI: 10.1525/elementa.2021.00120

Clark, E. M., S. C. Merrill, **L. Trinity**, G. Bucini, N. Cheney, O. Langle-Chimal, T. Shrum, C. J. Koliba, A. Zia, J. M. Smith. (2021) Emulating Agricultural Disease Management: Comparing Risk Preferences Between Industry Professionals and Online Participants Using Experimental Gaming Simulations and Paired Lottery Choice Surveys. *Frontiers in Veterinary Science.* DOI: 10.3389/fvets.2020.556668

Trinity, L., S. C. Merrill, E. M. Clark, C. J. Koliba, A. Zia, G. Bucini, J. M. Smith (2020) Effects of Social Cues on Biosecurity Compliance in Livestock Facilities: Evidence from Experimental Simulations. *Frontiers in Veterinary Science*. DOI: 10.3389/fvets. 2020.00130

Clark, E. M., S. C. Merrill, **L. Trinity**, G. Bucini, N. Cheney, O. Langle-Chimal, T. Shrum, C. J. Koliba, A. Zia, J. M. Smith. (2020) Using experimental gaming simulations to elicit risk mitigation behavioral strategies for agricultural disease management. *PLOS ONE.* DOI: 10.1371/journal.pone.0228983

Bucini, G., S. C. Merrill, E. M. Clark, S. Moegenburg, A. Zia, C. J. Koliba, S. Wiltshire, **L. Trinity**, and J. M. Smith. (2019) Risk attitudes affect livestock biosecurity decisions with ramifications for disease control in a simulated production system. *Frontiers in Veterinary Science*. DOI: 10.3389/fvets.2019.00196

Merrill, S.C., S. Moegenburg, C. J. Koliba, A. Zia, **L. Trinity**, E. M. Clark, G. Bucini, S. Wiltshire, T. Sellnow, D. Sellnow, and J. M. Smith. (2019) Willingness to comply with biosecurity in livestock facilities: evidence from experimental simulations. *Frontiers in Veterinary Science*. DOI: 10.3389/fvets.2019.00156

Press Releases

Scientists predict structure of SARS-CoV-2 frameshifting pseudoknot. News Medical: Life Sciences. Mar. 8, 2022. https://tinyurl.com/msfb532e

The UVM SEGS Lab: Social Ecological Gaming & Simulation on 'Across The Fence'. University of Vermont: Extension. Oct. 9, 2019. https://tinyurl.com/yxsozw6p

How Video Games Could Help Protect the Agriculture Industry. Viglienzoni, Cat. WCAX 3, Jul. 5, 2019. https://tinyurl.com/2hmwyssb

Video Game Helps Farmers Fight Disease. Hensley, Kerry. Voice of America, Jun. 27, 2019. https://tinyurl.com/yckjfbwt

Awards

T32 Fellowship in Precision Genetics of Aging *The Jackson Laboratory for Genomic Medicine*	**Sep 2024**
Graduate Award *University of Victoria*	**Apr 2022, Apr 2023, July 2023**
Finalist: 3 Minute Thesis *University of Victoria*	**Mar 2022**
2nd Place Speaker: 3 Minute Thesis *Vancouver Bioinformatics Users Group*	**Dec 2021**
Graduate Fellowship *University of Victoria*	**Jan 2020 – Dec 2021**
President's Fellowship in Research-Enriched Teaching *University of Victoria*	**August 2020 – May 2021**
BC AquaHacking Challenge Finalist *University of Victoria*	**Jun 2020**
Graduate Research Assistantship *University of Vermont*	**Sep 2018 – Dec 2019**

Volunteer Work

Programmer   **Jan 2020 – Present**
CFUV 101.9 FM, Victoria, BC

> Hosting the Vibration Elevation radio show via CFUV 101.9 FM Victoria, our campus and community radio station. CFUV is a volunteer based non-profit arts & media organization. CFUV elevates and amplifies marginalized and underrepresented communities through the creation and presentation of audio programming, with a specific emphasis on local, Canadian, and feminist artists.

Computer Science Department Steward   **Sep 2022 – Aug 2023**
Canadian Union of Public Employees, Victoria, BC

> Assist in providing orderly and speedy procedure for settling of grievances and subsequent resolutions. Responsibility to aid any employee represented by the Union in accordance with the grievance procedure. Ensure employees required to be absent from work will suffer no loss of pay and benefits.

Girls Who Code Volunteer   **Aug 2018 – Dec 2019**
University of Vermont, Burlington, VT

> Volunteered with the Girls Who Code organization to amplify and uplift historically underrepresented groups. Increased inclusion and diversity by providing education, equipment, and inspiration to girls. Improved computing skills towards positive change in our community.

Member Worker   **Aug 2018 – Dec 2019**
City Market / Onion River Co-op, Burlington, VT
> Coordinated with local community partners including Old Spokes Home bike shop and Vermont Youth Conservation Corps community farm. Assisted with shop upkeep and farm duties.

Karma Yogi   **Jun 2018 – Dec 2019**
Evolution Physical Therapy and Yoga Studio, Burlington, VT
> Check in classes and studio workshops. Maintain general cleanliness, organization, and well-being of the active office environment.

Technical Skills

Languages: Bash, CSS, C++, C#, HTML, Java, Javascript, PHP, Python, R, Seq, SQL
Platforms: Access, Arduino, Azure, Unity
Certifications: CITI Social-Behavioral-Educational Researcher 2021-2024; Adobe Certified Associate (Photoshop)
Reviewer: International Journal of Disaster Risk Reduction (2023), Journal of Biomolecular Structure & Dynamics (2023)**,** Molecular Therapy (2022-23), Intelligent Systems for Molecular Biology (2020)

Presentations (*Oral, ±Poster)

***Trinity, L.** *Tying the Knot: RNA Secondary Structures of the Coronavirus Frameshift Element.* The Jackson Laboratory for Genomic Medicine. Farmington, CT. Apr. 11, 2024.

***Trinity, L.** *Algorithms for Prediction of RNA Secondary Structure: Coronavirus Pseudoknots via Shapify and CParty.* University of Victoria, ECS 467. Victoria, British Columbia. Jan. 15, 2024.

***Trinity, L.** *Free energy minimization and partition function approaches: CParty and HFold algorithms for RNA structure prediction.* University of Victoria, COBRA Lab. Victoria, British Columbia. Oct. 20, 2023.

***Trinity, L.** *Secondary and tertiary structure prediction of frameshift RNA in homologous betacoronaviruses.* University of Victoria, COBRA Lab. Victoria, British Columbia. Sep. 8, 2023.

***Trinity, L.** *Cis-mediated interactions affecting ribosomal frameshift mechanics.* University of Victoria, COBRA Lab. Victoria, British Columbia. Aug. 18, 2023.

***Trinity, L.** *Betacoronavirus frameshift motifs.* University of Victoria, COBRA Lab. Victoria, British Columbia. Jun. 9, 2023.

***Trinity, L.** *Length dependent conformations of SARS-CoV-2 frameshift pseudoknots.* University of Victoria, COBRA Lab. Victoria, British Columbia. Oct. 28, 2022.

***Trinity, L.**, I. Wark, H. Jabbari, U. Stege. *Shapify: Pathways to SARS-CoV-2 frameshifting pseudoknot.* Computational Approaches to RNA Structure Prediction. Benasque, Spain. Aug. 12, 2022.

***Trinity, L.** *Conformational plasticity and protein isoform interaction of RNA pseudoknots.* University of Victoria, COBRA Lab. Victoria, British Columbia. Feb. 25, 2022.

*Clark, E., G. Bucini, S.C. Merrill, O. Langle, , C. Koliba, **L. Trinity**, T. Shrum, A. Zia, J.M. Smith. *Linking experimental games with agent based models to quantify agricultural outbreak dynamics.* Conference of Research Workers in Animal Disease. Chicago, Illinois. Dec. 3-7, 2021.

*Smith, J.M., S.C. Merrill, G. Bucini, N.A. Cheney, E. Clark, C.J. Koliba, O. Langle-Chimal, D. D. Sellnow, T. L. Sellnow, T. Shrum, **L. Trinity**, A. Zia. *Animal disease spread models can be improved by including human behavior.* Conference of Research Workers in Animal Disease. Chicago, Illinois. Dec. 3-7, 2021.

*Liu, T., A. O'Keefe, E.M. Clark, S.C. Merrill, **L. Trinity**, T.R. Shrum, C.J. Koliba, A. Zia, J.M. Smith. *Does the language of information delivery influence biosecurity compliance? Insights from experimental simulations.* Conference of Research Workers in Animal Disease. Chicago, Illinois. Dec. 3-7, 2021.

*Clark, E., G. Bucini, S.C. Merrill, A. Zia, C.J. Koliba, **L. Trinity**, S. Wiltshire, and J.M. Smith. *Biosecurity and Herd Health: Experimental Simulations for Quantifying Behavioral Risk.* Guest Lecture Series. Introductory Animal Sciences. University of Vermont. Sep. 14, 2021.

***Trinity, L.**, L. Lansing, H. Jabbari, U. Stege. *SARS-CoV-2 Ribosomal Frameshifting Pseudoknot: Detection of Inter-viral Structural Similarity*. IEEE International Conference on Healthcare Informatics. Victoria, British Columbia. Aug. 12, 2021.

*Merrill, S.C., R. Schattman, **L. Trinity** and Eric Clark. *Motivators of agricultural conservation practice adoption*. Vermont EPSCoR Research Slam. Burlington, Vermont. Aug. 9, 2021.

***Trinity, L**. *Chromosome Genetic Expression Visualization.* St. Margaret's School via University of Victoria Speakers Bureau. Victoria, British Columbia. Feb. 24, 2021.

*Clark, E., G. Bucini, S.C. Merrill, A. Zia, C.J. Koliba, **L. Trinity**, S. Wiltshire, and J.M. Smith. *Biosecurity and Herd Health: Digital Tools for Quantifying Behavioral Risk.* University of Vermont Introductory Animal Sciences Guest Lecture Series. Burlington, Vermont. Sep. 17, 2020.

±**Trinity, L.**, A. Hollar, H. Greenyer, H. Jabbari. *Visualization of gene regulation in endothelial cells that are programmed to human pluripotent stem cells and differentiated to endothelial or neuronal cells.* Bioinformatics Open Source Conference. Vancouver, British Columbia. July. 20, 2020.

***Trinity, L.** *Diverse function of RNA pseudoknots.* University of Victoria, COBRA Lab. Victoria, British Columbia. Jun. 12, 2020.

±**Trinity, L.**, H. Jabbari, U. Stege. *Characterizing Stem Cell Gene Regulation: Differentiated Endothelial vs. Neuronal Cells*. Ideafest. Victoria, British Columbia. Mar. 7, 2020.

*Clark, E., S.C. Merrill, S. Moegenburg , **L. Trinity**, G. Bucini, C. Koliba, A. Zia, and J.M. Smith. *Simulating Outbreak Scenarios For Distinguishing Risk Mitigation Behavioral Strategies Across Agricultural Production Networks*. The International Society for Economics and Social Sciences of Animal Health (ISESSAH). Atlanta, Georgia. Jul. 21-23, 2019.

*Merrill, S.C., **L. Trinity, R. Schattman, E. Clark, C. Koliba, A. Zia, G. Bucini, J. Faulkner and J. M. Smith. *Serious games: Agriculture, Climate Change and Water Quality.* Workshop for the Basin Resilience to Extreme Events High School Students and Teachers Training Week. Colchester, VT. Jun. 17, 2019.

*Merrill, S.C., **L. Trinity, C. J. Koliba, S. Moegenburg, T. Sellnow, E. Clark, A. Zia, G. Bucini, S. Wiltshire, and J. M. Smith. *Serious Games and Decision Making.* Animal Disease Biosecurity Coordinated Agricultural Project (ADB CAP) Symposium: Innovation and Collaboration for Agricultural Biosecurity. College Park, MD. May 15-16, 2019.

*Koliba, C. J., S. C.Merrill, G. Bucini, E. M. Clark, **L. Trinity**, and R. Beattie, R. Faculty Activity Network. *Social Ecological Games and Simulation Laboratory FAN*. Office of the Vice President for Research. University of Vermont. May 6, 2019.

*Trinity, L., S.C. Merrill, S. Moegenburg, C.J. Koliba, A. Zia, E. Clark, G. Bucini, S. Wiltshire, T. Sellnow, D. Sellnow, and J. M. Smith. *Human behavioral factors influencing biosecurity compliance: Evidence from an Experimental Game*. Student Research Conference, University of Vermont, Burlington, VT. Apr. 17, 2019.

*Trinity, L., S.C. Merrill, S. Moegenburg, C. J. Koliba, A. Zia, E. Clark, G. Bucini, S. Wiltshire, T. Sellnow, D. Sellnow, and J. M. Smith. *Effects of Message Delivery Method on Biosecurity Compliance: Evidence from an Experimental Game*. International Crisis and Risk Communication Conference, Orlando, FL. Mar. 13, 2019.

*Trinity, L. and N. Shenton. *The Image of Celebrity Death via Twitter*. Final Presentation, Principles of Complex Systems (CSYS 300), University of Vermont, Burlington VT. Dec. 11, 2018.

*Bucini, G., E. Clark, S. C. Merrill, C. J. Koliba, A. Zia, S. Wiltshire, **L. Trinity, S. M. Moegenburg, and J. M. Smith. *The role of human behavior in biosecurity adoption: interactive tools for intervention strategies*. PIC Health Assurance Annual Fall Meeting, Cerdanyola del Vallés, Spain. Nov. 28-29, 2018.

*Bucini, G., S. Wiltshire, E. Clark, S. C. Merrill, C. Koliba, A. Zia, **L. Trinity, S. Moegenburg, and J. M. Smith. *Interactive model-based tools for animal disease simulation and intervention strategies*. ISESSAH-InnovSur 2018 Conference, Montpellier, France. May 14-18, 2018.

*Bucini, G., E. Clark, J. M. Smith, S. C. Merrill, A. Zia, C. Koliba, S. Moegenburg, S. Wiltshire, **L. Trinity, and E. Reilly. *Interactive tools for simulation of biosecurity adoption and animal disease control*. Seminar. Animal and Veterinary Science Dept., University of Vermont, Burlington, VT. Feb. 16, 2018.

*Bucini, G., E. Clark, S. Wiltshire, S.C. Merrill, C. Koliba, A. Zia, **L. Trinity**, S. Moegenburg and J. M. Smith. *Hog production chain biosecurity model*. Animal Disease Biosecurity Coordinated Agricultural Project (ADB CAP) Team meeting, Orlando, FL. Jan. 10-12, 2018.

*±Stevens, T., X. Stevens, C. C. Chao, Y. Zhang, **L. Trinity,** B. Colombini. *Rehab Tracker*. Computer Science Fair, Advanced Project Demonstration. University of Vermont, Burlington, VT. Dec. 8, 2017.

±Merrill, S., T. Sellnow, G. Tonsor, C. Koliba, A. Zia, G. Bucini, L. Schulz, **L. Trinity**, C. Pudenz, E. Clark, S. Moegenburg, and J. M. Smith. *Modeling risk perception and biosecurity adoption in the swine industry*. Conference for Research Workers in Animal Disease, Chicago, IL. Dec. 3, 2018

*Bucini, G., S. Wiltshire, S.C. Merrill, E. Clark, **L. Trinity**, C. Koliba, A. Zia, S. Moegenburg and J. M. Smith. *Protecting herd health: Interactive agent-based modeling used to reduce the impact of disease in livestock industries*. Celebrating Excellence in Research, Larner College of Medicine, The University of Vermont, Burlington, VT. Nov. 10, 2017.

*Bucini, G., E. Clark, S. Wiltshire, S.C. Merrill, A. Zia, C.J. Koliba, **L. Trinity**, S. Moegenburg, and J. M. Smith. *Hog Production Chain Biosecurity Model.* Pre-conference workshop: Addressing Wicked problems: What tools are in the toolbox? Data gathering, data analysis and system simulation. Northeast Conference on Public Administration, , Burlington, VT. Nov. 3-5 , 2017.

*Bucini, G., S. Wiltshire, S.C. Merrill, A. Zia, C.J. Koliba, E. Clark, **L. Trinity**, S. Moegenburg, and J. M. Smith. *Regional U.S. Hog Production Chain Biosecurity Model*. Animal Disease Biosecurity Coordinated Agricultural Project (ADB CAP) Annual meeting, Mankato, MN. Jun. 12–14, 2017.

*Bucini, G., S. Wiltshire, S.C. Merrill, A. Zia, C.J. Koliba, E. Clark, **L. Trinity**, S. Moegenburg, and J. M. Smith. *Regional U.S. Hog Production Chain Biosecurity Model*. Agent-Based Modeling (ABM) 17 Symposium, San Diego, CA. April 19-21, 2017.

*±**Trinity, L.** *Animal Sound Quiz*. Computer Science Fair, Intermediate Web Design Demonstration. University of Vermont, Burlington, VT. Dec. 9, 2016.

*±**Trinity, L.,** S. C. Merrill, N. El-Naboulsi, and W. Nupp. *A Social-Ecological Experimental Game Examining Farmers' Willingness to Install Vegetative Buffer Strips*. North East Water Resource Network Regional Undergraduate Symposium. Kingston, RI. Aug. 12, 2016.

±Wynn. A., W. Nupp, E. Uchida, S. C. Merrill, H. Miao and **L. Trinity.** *How Farmer's Decisions Change in Response to Weather and Price Uncertainty*. North East Water Resource Network Regional Undergraduate Symposium. Kingston, RI. Aug. 12, 2016.