

Education

George Mason University, School of Systems Biology

Fairfax, VA

PhD in Bioinformatics & Computational Biology

Aug 2014 – May 2021

Dissertation: Molecular Clock Analysis of Human Adenovirus

Chair: Dr. Donald Seto; Co-Chairs: Dr. Patrick Gillevet & Dr. Sterling Thomas

Johns Hopkins University, Zanvyl Krieger School of Arts & Sciences

Baltimore, MD

MS in Bioinformatics

Nov 2009 – Dec 2011

Capstone: Parallel Algorithm for *de novo* Co-Expression Networks from Microarray Data

Adviser: Dr. Thomas Koval; Supervisors: Dr. Sterling Thomas & Dr. Catherine E. Campbell

Boston University, College of Arts & Sciences

Boston, MA

BA in Biochemistry & Molecular Biology, Minor in Computer Science

Sep 2005 – May 2009

Project: Microsatellite junction counts are inversely proportional to unit size, gap, and edit distance

Adviser: Dr. Gary Benson

Project: Type-II superconductor simulator for magnetic vortex formation

Adviser: Dr. George Ogurek Zimmerman

Skills

Biology	alignment, annotation, homology modeling, microarrays, omics, sequencing, PCR/LAMP, phylogenetics
Computing	data structures, GPU, HPC, microcontrollers, multithreading, numerical methods, parallel, UI
Programming	AWK, BASH, C, C++, C#, GLSL, HTML, Java, JavaScript, jq, JSON, perl, python, XML
Mathematics	calculus, geometry, linear algebra, MCMC, ML, signed-distance functions, statistics
Reproducibility	Conda, Docker, Git, L ^A T _E X, pip, R Markdown, Snakemake, Spack, Zotero
Database	BLAST+, ER modeling, PostgreSQL, SQL, SQLite
Language	Spanish (native), Japanese (JLPT 5)

Experience

Noblis, Inc.

Reston, VA

Scientist

Oct 2011 – Present

Develop algorithms and program applications for the design and evaluation of molecular diagnostics such as PCR/LAMP assays and multiplexed antigen tests for biosurveillance with refinements based on BSL-II experimentation. Analyze laboratory data for microbial based food and fuel production. Consult on interdisciplinary client work across corporate mission areas, internal R&D, and grant/proposal/patent submissions. Integrate advanced algorithms, machine learning, and statistics into reproducible and portable scientific workflows to generate publication quality reports. Design and supervise internship projects.

Recent and ongoing research projects include a phone app to interpret colorimetric LAMP assay and lateral flow immunoassay results using OpenCV, 3D-printed robot arm with computer vision for wet lab task automation (as PI), DNA-storage algorithm development (with patent submitted and experiment planned for the ISS), and AI-directed protein design with RFDiffusion, ProteinMPNN, AlphaFold, and laboratory validation.

As a cross-disciplinary scientist, past projects included microarray analysis, full-stack laboratory information management system (LIMS) development, expert system for well water remediation, stock trade automation, traffic congestion prediction, dark web social network analysis, statistical fingerprinting of nuclear fuel rods, forensic reverse-engineering of file formats, containerized computer virus scanning microservice frameworks (as PI), and efficient language detection on low-energy hardware.

On-Call Technical Intern

Aug 2011 – Oct 2011

Port algorithms to run on the CRAY XMT 2 supercomputer using the C programming language and compiler directives. Analyze *P. aeruginosa* microarray data to identify virulence factors. Also analyzed protein microarray data of hemorrhagic fever viruses from the BSL-III laboratory data from GMU.

Noblis/JHU Independent Research Project Fellowship

Jun 2011 – Aug 2011

Upgrade an algorithm for the analysis of host-pathogen interaction networks from microarray data. Develop an MPI-enabled version for parallel execution. Analyze human-plague (*Y. pestis*) microarray data to identify network motifs.

Infant & Toddler Connection of Fairfax-Falls Church

Fairfax, VA

Administrative Assistant II / Data Analyst

Sep 2009 – Jun 2011

Develop VBA macros for use with Microsoft Office applications. Automate administrative tasks using Windows batch scripts. Manage IT support at the Falls Church satellite site.

Boston University

Boston, MA

Laboratory for Biocomputing and Informatics

Sep 2008 – May 2009

Conduct research under the supervision of Dr. Gary Benson. Implement algorithms in Java and python using distance scoring, sequence alignment, and spaced-seed searching to analyze microsatellite junctions and tandem repeat evolution.

Experimental Condensed Matter Physics

Sep 2008 – May 2009

Conduct research under the supervision of Dr. George Ogurek Zimmerman. Program a type-II superconductor simulator to visualize phenomena related to magnetic field vortices in Java and python. Collaborate on the 2D implementation of the simulator and subsequently developed the 3D version.

Awards**Noblis, Inc.**

Reston, VA

Noblis Award for Excellence in Science and Technology

2023

For outstanding thought leadership and scientific contributions that advance and solve complex challenges on missions ranging from biodefense to cyber defense.

Board of Trustees' Award for Excellence

2021

For contributions to the Northern Virginia Innovation Exchange (NVIX).

Noblis Hackathon Honorable Mention

2017

Participated as part of team "Ghost in the Shell Script" in the 24-hr hackathon to improve the search algorithm of the RASMAS medical recall system. The Java solution employed an n-gram indexing strategy for calculating Jaccard similarity.

Projects**Homebrewing****Makgeolli**

Jan 2023 - Present

Brew traditional Korean rice wine. Developed an Arduino fermentation monitoring system combining an optoisolator and digital scale to track airlock bubble evolution and mass change over time and write logs to an SD card. Received funds from the Noblis Sponsored Research program to sequence samples and develop LAMP assays for microbes critical to the multiple parallel fermentation process. Results were presented as a talk at ASM 2024 in Atlanta, GA.

Capsid Modeling**Render viral capsids using Caspar-Klug Theory**

May 2020 – Present

In the browser with JavaScript to export SVG diagrams (democapsid @ <https://dnanto.github.io/democapsid/app.html>).
On the GPU with GLSL for realtime renders (protocapsid @ <https://www.shadertoy.com/view/dlsGRH>).

District Broomball Statistics**Database and website for league statistics**

Jun 2019 – Present

Design ER model, SQLite database, and R code with novel assist network visualizations for league statistics and website generation (<https://github.com/dnanto/broomball>).

Publications

Papers

- [1] **D. A. Negrón**, S. Trivedi, N. Tolli, D. Ashford, G. Melton, S. Guertin, K. Jennings, B. D. Necciai, S. Sozhamannan, and B. W. Abramson. "Loop-Mediated Isothermal Amplification Assays for the Detection of Antimicrobial Resistance Elements in *Vibrio Cholera*". In: *BMC Bioinformatics* 25.1 (Dec. 2024), p. 384. ISSN: 1471-2105. DOI: 10.1186/s12859-024-06001-3.
- [2] **D. A. Negrón**, J. Kang, S. Mitchell, M. Y. Holland, S. Wist, J. Voss, L. Brinkac, K. Jennings, S. Guertin, B. G. Goodwin, and S. Sozhamannan. "Impact of SARS-CoV-2 Mutations on PCR Assay Sequence Alignment". In: *Frontiers in Public Health* 10 (Apr. 2022). ISSN: 2296-2565. DOI: 10.3389/fpubh.2022.889973.
- [3] M. R. Wiley, L. Fakoli, A. G. Letizia, S. R. Welch, J. T. Ladner, K. Prieto, D. Reyes, N. Espy, J. A. Chitty, C. B. Pratt, N. D. Paola, F. Taweh, D. Williams, J. Saindon, W. G. Davis, K. Patel, M. Holland, **D. A. Negrón**, U. Ströher, S. T. Nichol, S. Sozhamannan, P. E. Rollin, J. Dogba, T. Nyenswah, F. Bolay, C. G. Albariño, M. Fallah, and G. Palacios. "Lassa Virus Circulating in Liberia: A Retrospective Genomic Characterisation". In: *The Lancet Infectious Diseases* 19.12 (Dec. 2019), pp. 1371-1378. ISSN: 1473-3099, 1474-4457. DOI: 10.1016/S1473-3099(19)30486-4.
- [4] S. Sozhamannan, M. Y. Holland, A. T. Hall, **D. A. Negrón**, M. Ivancich, J. W. Koehler, T. D. Minogue, C. E. Campbell, W. J. Berger, G. W. Christopher, B. G. Goodwin, and M. A. Smith. "Evaluation of Signature Erosion in Ebola Virus Due to Genomic Drift and Its Impact on the Performance of Diagnostic Assays". In: *Viruses* 7.6 (Jun. 2015), pp. 3130-3154. DOI: 10.3390/v7062763.
- [5] M. Vasudevan, **D. A. Negrón**, M. Feltz, J. Mallette, and K. Wunderlich. "Predicting Congestion States from Basic Safety Messages by Using Big-Data Graph Analytics". In: *Transportation Research Record* 2500.1 (Jan. 2015), pp. 59-66. ISSN: 0361-1981. DOI: 10.3141/2500-07.

Preprints

- [1] **D. A. Negrón**, N. Tolli, S. Guertin, S. Wollen-Roberts, S. Mitchell, J. Haas, C. Pratt, K. Jennings, B. Abramson, L. Brinkac, and D. Ashford. *Clade-Specific MPXV PCR Assays*. Preprint. Apr. 2023. DOI: 10.1101/2023.04.24.538151.
- [2] **D. A. Negrón**. "Molecular Clock Analysis of Human Adenovirus". PhD thesis. 312 Charles J. Colgan Hall, Science and Tech Campus, Manassas, VA: George Mason University, Sep. 2021.
- [3] **D. A. Negrón**. *Vectorized Capsid Rendering in the Browser with Capsid.js*. Preprint. Apr. 2021. DOI: 10.1101/2020.12.02.408252.
- [4] M. Holland, **D. A. Negrón**, S. Mitchell, N. Dellinger, M. Ivancich, T. Barrus, S. Thomas, K. W. Jennings, B. Goodwin, and S. Sozhamannan. *BioLaboro: A Bioinformatics System for Detecting Molecular Assay Signature Erosion and Designing New Assays in Response to Emerging and Reemerging Pathogens*. Preprint. Apr. 2020. DOI: 10.1101/2020.04.08.031963.
- [5] Holland, Mitchell Y., **D. A. Negrón**, Shane Mitchell, Mychal Ivancich, Katharine W. Jennings, Bruce Goodwin, and Shanmuga Sozhamannan. *Preliminary in Silico Assessment of the Specificity of Published Molecular Assays and Design of New Assays Using the Available Whole Genome Sequences of 2019-nCoV*. Preprint. Noblis, Inc., Jan. 2020.
- [6] J. Kang, **D. A. Negrón**, J. Li, Q. Wang, Q. Zhang, and D. Seto. *Genomic Analysis of a Human Adenovirus Type Strain Associated with an Outbreak*. 312 Charles J. Colgan Hall, Science and Tech Campus, Manassas, VA, 2020.
- [7] **D. A. Negrón**. *Parallel Algorithm for de Novo Co-Expression Networks from Microarray Data*. Report. The Johns Hopkins University, 9601 Medical Center Drive, Rockville, MD: The Johns Hopkins University, Aug. 2011.
- [8] **D. A. Negrón**. *Microsatellite Junction Counts Are Inversely Proportional to the Size, Gap, and Edit Distance of Its Constituent Units*. Report. Laboratory for Biocomputing and Informatics: Boston University, May. 2009.

Patents

- [1] M. K. Monaco, **D. A. Negrón**, and B. Satira. "Data Loss Prevention". US11580248B2. Feb. 2023.
- [2] M. J. Sanders, D. M. Masi, E. R. McCabe, E. J. Maciejewski, N. S. Dellinger, and **D. A. Negrón**. "Network Topology Discovery". US11522783B2. Dec. 2022.

- [3] M. K. Monaco, **D. A. Negrón**, and B. Satira. "Data Loss Prevention". US10915654B2. Feb. 2021.
- [4] M. K. Monaco, **D. A. Negrón**, B. Satira, and M. Collins. "Network Security Using Inflated Files for Anomaly Detection". US10924502B2. Feb. 2021.
- [5] M. Omari, T. W. Barrus, M. Sanders, and **D. A. Negrón**. "Rapid Genomic Sequence Classification Using Probabilistic Data Structures". US11037654B2. Jun. 2021.
- [6] M. K. Monaco, **D. A. Negrón**, and B. Satira. "Data Loss Prevention". US10331902B2. Jun. 2019.

Posters

- [1] G. Melton, **D. A. Negrón**, K. W. Jennings, S. Sozhamannan, K. Hauser, and B. W. Abramson. *Optimization of LAMP Assay Parameters Based on Thermodynamic Analysis of Peer-Reviewed Primers*. Poster. Los Angeles, CA, Jun. 2025.
- [2] **D. A. Negrón**, B. Abramson, N. Tolli, D. Ashford, K. Jennings, and S. Sozhamannan. *Colorimetric and Positional Application to Breakdown LAMP Evaluation (CAPABLE)*. Poster. Atlanta, GA, Jun. 2024.
- [3] N. Tolli, **D. A. Negrón**, B. Abramson, D. Ashford, and K. W. Jennings. *Clade-Specific Mpox Multiplex Polymerase Chain Reaction Assay*. Poster. Washington, D.C., Oct. 2024.
- [4] **D. A. Negrón**, N. Tolli, B. Abramson, D. Ashford, and K. Jennings. *Novel Clade-specific Monkeypox PCR Assays Validated In Vitro*. Poster. ASM Microbe 2023, Houston, TX, Jun. 2023.
- [5] **D. A. Negrón**. *Implementation Of Bacilliform Viral Capsid Models*. Poster. ASM Microbe 2022, Washington, DC, Oct. 2022.
- [6] **D. A. Negrón**, J. Kang, S. Mitchell, and K. Dommaraju. *A Nextclade Dataset for Genotyping Human Adenovirus*. Poster. ASM Microbe 2022, Washington, DC, Jun. 2022.
- [7] **D. A. Negrón**, S. Mitchell, M. Y. Holland, D. Ashford, and K. Jennings. *PCR and LAMP Assays for African Swine Fever Virus and Foot-and-Mouth Disease Virus*. Poster. ASM Microbe 2022, Washington, DC, Jun. 2022.
- [8] **D. A. Negrón**. *Elongated Capsid Generation in the Browser*. Poster. SSB Student Research Day, George Mason University, Apr. 2021.
- [9] **D. A. Negrón**. *Vectorized Capsid Generation in the Browser*. Poster. SSB Student Research Day, George Mason University, Dec. 2020.
- [10] S. Thomas, T. Barrus, and **D. A. Negrón**. *Detection of Engineered E. Coli Reference Genomes within NCBI Using Molecular Clock Analysis*. Poster. Sequencing, Finishing, and Analysis in the Future, Dec. 2020.
- [11] **D. A. Negrón** and S. Sozhamannan. *Automated Molecular Clock Analysis of the O-PS Gene Cluster of Vibrio Cholerae*. Poster. 54th US-Japan Joint Panel Conference on Cholera and Other Bacterial Enteric Infections, Osaka, Japan, Dec. 2019.
- [12] **D. A. Negrón**, B. Goodwin, M. Smith, and S. Sozhamannan. *Phylogenetic Analysis of the O-Antigen Biosynthesis Genes in Vibrio Cholerae*. Poster. Sequencing, Finishing, and Analysis in the Future Meeting, Santa Fe, NM, Jun. 2016.
- [13] J. Kennedy, D. Montoya, J. Tang, **D. A. Negrón**, and K. Taylor. *Noblis' BioVelocity Is a Comprehensive and Rapid Post-Sequencing Bioinformatics Tool to Enhance Food Biosecurity, Biosurveillance and Outbreak Investigations through Precise Pathogen Detection*. Poster. Sequencing, Finishing, and Analysis in the Future Meeting, Santa Fe, NM, May. 2015.
- [14] **D. A. Negrón** and S. Sozhamannan. *Functional Unity in Structural Diversity: Genetic Basis of Diversity in O-Antigen Biosynthesis Genes in Vibrio Cholerae*. Poster. asm2015, New Orleans, LA, Jun. 2015.
- [15] **D. A. Negrón**. *Perfect Repeats Detection on the CRAY XMT 2*. Poster. Noblis, Inc., Falls Church, VA, 2013.
- [16] **D. A. Negrón** and S. Thomas. *Co-Expression Network Generation from Microarray Data on the Cray XMT*. Poster. Center for Biotechnology Education 7th Annual Research Symposium, The Johns Hopkins University, Rockville, MD, May. 2012.

- [17] **D. A. Negrón**. *Parallel Algorithm for de Novo Co-Expression Networks from Microarray Data*. Poster. The Johns Hopkins University, 9601 Medical Center Drive, Rockville, MD, Aug. 2011.
- [18] S. Thomas, J. Buthod, and **D. A. Negrón**. *Discovering Host-Pathogen Interactions and Pathways Through Data Integration*. Poster. Defense Threat Reduction Agency Science and Technology Conference, Las Vegas, NV, Nov. 2011.

Presentations

- [1] **D. A. Negrón**. *Characterization of Microbial Populations throughout the Multiple Parallel Fermentation Process of Makgeolli Brewing*. Talk. Atlanta, GA, Jun. 2024.
- [2] S. Sozhamannan, **D. A. Negrón**, M. Rajavel, and G. Xie. *Building A Smart Wall With The Strength Of Diversity - What Can We Learn From Bacteria?* Talk. Sequencing, Finishing, and Analysis in the Future, Santa Fe, NM, May. 2018.
- [3] M. Collins and **D. A. Negrón**. *Mushrooms Not Honey: Making Deceptive Defenses More Toxic for Attackers*. Talk. RSA Conference, San Francisco, CA, Feb. 2017.
- [4] **D. A. Negrón**. *Deceptive Defence*. Talk. BloomCON 0x02 Forensics and Security Conference, Bloomsburg, PA, Mar. 2017.
- [5] S. Baez-Cazull, **D. A. Negrón**, A. Rak, M. Bruckner, D. Gimón, P. Hayes Jr., S. James, E. McCabe, and J. Moore. *Big Data Analysis and Visualization to Identify Best Technology to Meet Remedial Objectives*. Talk. Tenth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Palm Springs, CA, May. 2016.
- [6] S. Thomas, **D. A. Negrón**, A. Bolipata, T. Barrus, N. Dellinger, M. Holland, J. Tang, and D. Weaver. *Implementing Fast Sequence Analysis Tools Using a Cray XMT2*. Talk. Sequencing, Finishing, and Analysis in the Future, Santa Fe, NM, May. 2013.